

Information Needs in Environmental Scanning for Sustainable Supply Chains

Empirical research and actionable typologies

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Abstract

Sustainable supply chain has emerged as a new approach that tries to integrate sustainable development with supply chain activities. But a lack of capacity to be informed about evolutions in the business environment has been identified as a barrier to starting sustainable initiatives in supply chains. From this perspective, Environmental Scanning can help managers satisfy their need for external information. However, to limit information overload and satisfy these information needs, Environmental Scanning activities must be targeted. Our research aims at identifying which actors and topics best describe the information needs of organizations in an Environmental Scanning process for sustainable supply chain. The objective is not to elaborate exhaustive typologies, but actionable ones that can be adapted to the context and priorities of each organization.

Our research follows a two-step process. First, we proceed with a thematic analysis of 42 interviews with 50 managers from 40 organizations to identify actors and topics associated with sustainable supply chain issues. Then, the validity and actionability of these typologies are evaluated by 27 managers in 10 organizations. These typologies were corroborated as useful tools to help managers initiate a comprehensive understanding of sustainable logistic issues. Also, they helped identify information needs adapted to the context of each organization in terms of Environmental Scanning for Sustainable Supply Chains.

Introduction

Sustainable Development (SD) inside an organization is transversal, since its adoption may affect almost all the business areas. Supply Chain activities are traditionally associated with pollution, but they can also be the source of holistic solutions to economical, social and environmental issues [1]–[4].

The interaction between SD and Supply Chain activities results in the concept of Sustainable Supply Chain (SSC). A SSC is “one that performs well on both traditional measures of profit and loss as well as on an expanded conceptualization of performance that includes social and natural dimensions” [2]. But in practice SSC initiatives are confronted with prohibitive barriers such as cost concerns [5], lack of legitimacy [6], lack of customer interest [7], poor supplier commitment [8], lack of guidelines and

monitoring frameworks [9]–[11], non-inciting regulation [12], and other business specific barriers [13], [14]. Among these barriers, lack of external information is identified as an obstacle preventing initiation of SSC projects [7], [8], [15]. Very few previous studies have addressed how to help managers satisfy their information needs in SSC.

Environmental Scanning (ES) can help managers satisfy their information needs concerning SSC issues [16]. ES is “the acquisition and utilization of information about events, trends and the dynamics of the external environment, the knowledge of which would help managers to orient the course of their future actions” [17]. However, to optimize resource allocation and get useful results, ES activities need to be targeted to the right part of the environment. “The target comprises a list of actors in the environment and a list of topics” [18] that are relevant to the organization. Thus this research aims at identifying typologies of actors and topics that can help managers identify their information needs in Environmental Scanning for Sustainable Supply Chain. The objective is not to elaborate exhaustive typologies, but actionable ones that can be adapted to the context and priorities of each organization.

The next section explores how ES can satisfy information needs for SSC. Afterwards, the research methodology used to elaborate typologies of actors and topics is presented. Finally, results are presented and discussed.

Literature review

Linking Sustainable Supply Chain and Environmental Scanning

The study of SSC is an emerging research area that has not yet reached a consensus framework and its implications are neither stable nor clear [1], [2], [9]. Pagell and Wu [2] propose that a SSC must balance between the three dimensions of SD. But in practice the notion of SSC seems to suffer a “dimensional reduction” with a tendency to be oriented to environmental and economic aspects, leaving social issues aside [2], [3]. In this research, we adopt the holistic view of SSC that considers all three dimensions of SD as part of a whole.

In practice, there are two types of interactions between supply chains and SD:

- A reactive interaction that can be described as the compliance-driven behavior of organizations that try to survive, accept and have a palliative attitude towards sustainability [9]. The adoption of SD seems to come as the response to external triggers, such as customer pressures or government regulation [7], [8].
- A proactive interaction that is the behavior of organizations looking forward to transforming a constraint into an opportunity, and to integrate SD in their supply chains, not as a response to external pressures but as an effort to win new customers or improve financial performance [6], [7], [19], [20].

In this research we are interested in “proactive behavior”. Thus, ES could be used to anticipate changes and help organizations identify opportunities, or at least to try to avoid being harmed in the future by the integration of SD in supply chain activities [16].

Environmental Scanning (ES) is “the acquisition and utilization of information about events, trends and the dynamics of the external environment, the knowledge of which would help managers to orient the course of their future actions” [17]. In practice there are two distinct but complementary modes of data acquisition and utilization [21], [22]:

- Focused search (or seeking) is used when managers are already involved in a decision-making process, and looking for reliable and non-ambiguous information to

better understand the decision context, choices and implications. Thus focused search mode is initiated and driven to help answer managers' questions.

- Scanning (or general browsing of data) is used when managers have no specific pending decision to guide a focused search, and are vigilant to information that could eventually help identify, uncover or anticipate changes and opportunities in the organization's business environment. It operates like a sort of pre-attentive monitoring without an identified question to guide the research.

In this research we are interested in "scanning" mode. Accordingly, ES is defined as "the collective, proactive process through which members of the organization deliberately track down, interpret and use relevant anticipative information items relating to their outside environment and to the changes that may occur in it" [18].

Our research aims at providing useful knowledge for managers and organizations involved both in "proactive interaction" between supply chain and SD, and "scanning" mode of data acquisition and utilization. To be efficient, provide useful results, and enhance organizational capacity for anticipation, strategic priorities in terms of information needs must be defined [22] and ES activities must also be directed or targeted to the right part of the business environment [23].

Targeting the Environmental Scanning for Sustainable Supply Chain

The first step of the ES process is the targeting of the socio-economic environment. In practice, organizations cannot scan their overall environment because this action implies the investment of unlimited resources in an endless project. "Scanning targeting is the operation that consists of delineating that part of the organization's external environment that is a common interest to potential users of the scanning information." [18]. The benefits of targeting ES are the following [24]:

- Helping decision makers specify what information they may need.
- Delimiting the parts of the business environment on which to focus attention.
- Efficiently using those resources dedicated to ES.
- Identifying areas of interest common to members of the ES process.
- Providing pertinent information for participants of the ES process.

The result of targeting ES is an objective consisting of lists of actors and topics to put under surveillance. On the one hand, these lists should be non-extensive to be useful in practice. On the other hand, they should evolve as a function of improvements of an organizations' capacity to capture information, environmental evolutions or even changes of management priorities [18]. In the context of ES targeting, actors and topics are defined as follows [24]:

- An actor is a natural or legal person, external (sometimes internal) to the organization; whose decisions and actions could have an influence on the future of the organization or on activities for which it is responsible. This concept of actor is close to that of stakeholder proposed by Freeman [25].

- A topic is a center of interest when considering the future of the organization.

Using these definitions, our research aims at identifying typologies of actors and topics that can help managers identify their scanning information needs in SSC and build targets adapted to their strategic priorities.

Research design and methodology

We followed a two-step methodology in this research. First, we proceed with a thematic analysis of 42 interviews to identify typologies of actors and topics associated

by managers and organizations with SSC issues. Then, 27 managers in 10 organizations evaluated the validity and actionability of these typologies.

Stage 1: Building typologies of Environmental Scanning's actors and topics for Sustainable Supply Chains

Initially, we conducted semi-structured interviews to obtain primary data from representatives and staff members from the organizations. We were interested in including organizations that operate at distinct places in the supply chain and that belong to different business sectors.

We directed our interviews using a semi-structured interview guide that was previously tested. The guide included 6 themes related to SD, supply chain management and logistics activities, ES, SSC issues, ES and ES for SSC. The interviews each took one hour on average. They were recorded and transcribed word-for-word. We conducted these interviews until we reached a saturation point [26] at which point we started to hear similar information repeated over and over. In the end, we conducted 42 interviews with 50 representatives from 40 organizations.

Interviews were double-coded based on the performance indicator topics of the 2006 version of the Global Reporting Initiative (GRI) which we used as our reference categories for topics, and on Freeman's stakeholder theory [25] for coding actors.

We used the GRI grid as our topic-coding scheme for two reasons. On the one hand, because the framework proposed by GRI is the most widely used standard for sustainability reporting, and it is continuously developed through a multi-stakeholder, consensus-seeking approach [10], [27], [28]. On the other hand, because we are interested in a holistic view of SSC, and GRI indicators cover all three dimensions of SD going beyond to traditional research approaches usually centered only on ecologic and economic aspects.

We then used a thematic analysis of coded items from the interviews to let topics "emerge". That means each item was coded with the "naturally identified" topics from the text [26], then the identified sub-topics were grouped under the topics proposed in the GRI framework. Finally, we classed results as meta-topics, topics based on the GRI framework, and sub-topics coming from thematic analysis.

We proceeded similarly to identify actors, also classing them in three levels: meta-group of actors, group of actors and actors. An additional distinction was made between external and internal stakeholders. We started by identifying stakeholders as defined in the work of Freeman [25] as our reference for a meta-group of actors. Using thematic analysis we identified a complementary meta-group of actors. We were also able to identify the group of actors included in the meta-groups. Finally, nominative actors were organized inside each group of actors.

To obtain the number of organizations in Stage 1 for which a topic is relevant, we counted those where the particular topic was identified at least once in thematic analysis. We used the same considerations for actors.

Stage 2: Evaluating the relevance of actor and topic typologies

To evaluate the relevance of our two initial typologies, we proceeded to 10 experiments with real applications with 27 managers in 10 organizations interested in the problematic of SSC. Once again, we were interested in organizations coming from different places with their supply chains, but more especially, organizations operating in manufacturing and distribution.

In the academic literature, the targeting phase has been instrumented and documented as a method called Target® [22]. This research focuses on steps 2 and 4 of the Target® method as shown in Figure 1. We intentionally modified the method to include our initial typologies during the experiments. Originally, relevant actors and topics are identified by the participants themselves and not suggested in the form of lists. The adaptations are presented with double asterisks (**) in Figure 1.

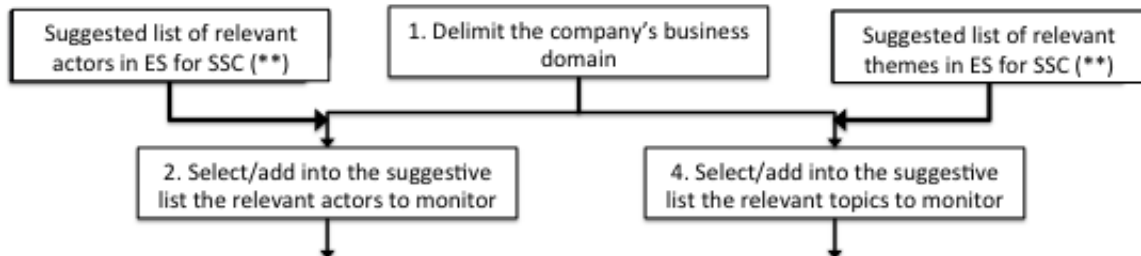


Figure 1 Adaptation of the Target® method for the purpose of our research

Experiments were conducted in working meetings where participants were asked to retain from a suggested list the actors and topics they considered as relevant in terms of SSC for their organizations, and explain why. They could also suggest new actors or topics to add to lists and make comments as they wanted. The experiments lasted between two and three hours each. The participation was systematically taped, and the selected list of actors and topics were saved using a software tool we developed for this purpose. To obtain the number of organizations in Stage 2, we counted the number of experiments when managers selected the particular topic as relevant in the proposed lists. We use the same considerations for actors.

Results

A typology of relevant topics in ES for SSC

The resulting typology after interviews and research is composed of seven meta-topics: Environmental, Human rights, Labor practices and decent work, Product responsibility, Society, Regulations and Logistics. These meta-topics group 54 topics. Inside the topics level we identified 107 subtopics. Full typology can be provided on request.

All the meta-topics proposed by GRI were retained during interviews and experiments. All participating organizations in both stages of the research retained environmental meta-topics. The other meta-topics were all retained in Stage 1, but less systematically in Stage 2. Only one topic proposed by GRI was never retained: Customer privacy. Six topics were not retained in the first stage but were retained in the second, they were Forced and compulsory labor, Freedom of association and collective bargaining, Indigenous rights, Security practices, Anti-competitive behavior, and Corruption. Finally, Local community was identified 35 times in interviews but was never retained in experiments.

As a result of the thematic analysis in Stage 1, we added two new topics to those proposed by the GRI: Quality of work life under Human Rights, and Humanitarian under Society. Both new topics were also retained during Stage 2. Logistics as a meta-topic was also added on account of the relation of this subject with SSC. Proposed logistics topics were retained in both research stages.

The topic Compliance was originally included in Environmental, Product responsibility and Society in the GRI framework. However, these topics were grouped

in a new transversal meta-topic called Regulations for two reasons: first, participants referred to regulations in a holistic way without distinction between the diverse facets of SD. Secondly, because organizations were interested not only in complying with laws but also in the evolution of regulation content. Managers in both research stages retained Regulation topics (internal rules, laws, norms and agreements) as relevant for SSC.

Table 1 shows the resulting topics and sub-topics for Product Responsibility. Sub-topics were identified from our thematic analysis in Stage 1. On the one hand, 20 sub-topics were not retained during experiments in Stage 2. Some of these were: Reputation/notoriety, Food safety or Communications actions. On the other hand, managers proposed 12 sub-topics during experiments, including: Environmental information, Expectation toward commitment to SD, or Teaching consumers.

Globally, the typology of topics proposed from Stage 1 was satisfactorily validated during Stage 2. Neither the structure nor the contents of the proposed typologies from the interviews were questioned during experiments. From the topics identified after Stage 1, 86.62% were also retained by participants during Stage 2. This result suggests a good relevancy of the proposed typology of topics to the information needs of organizations in terms of ES for SSC.

Table 1 Resulting topics and subtopics for “Product Responsibility” meta-topic

Meta-topics / Topics / Sub-topics	GRI indicators	Stage 1 Interviews ¹	Stage 2 Experiments ²
□ Product responsibility	✓	31	7
- Product and service labeling	✓	9	4
Environmental information *	-	-	1
Quality customer service *	-	3	1
Product traceability *	-	6	2
- Marketing communications	✓	27	3
Communication for SD initiative *	-	-	1
Reputation / notoriety *	-	12	-
Communication actions *	-	25	-
Expectation toward commitment to SD *	-	-	2
Teaching consumers *	-	-	1
- Customer privacy **	✓	-	-
- Consumers health and safety	✓	11	5
Food safety *	-	5	-
Population health and safety *	-	7	4

¹ Number of interviews where the topic was retained

² Number of experiments where the topic was retained

* Topic added or changed as result of thematic analysis

** Suggested topic in coding scheme but not retained during interviews and experiments

A typology of relevant actors in ES for SSC

Our research allows identifying 34 meta-groups of actors as external stakeholders and 5 as internal. Thirteen of these are consistent with Freeman’s stakeholder theory [25]. The other 21 were identified by the analysis of interviews in Stage 1 or by the suggestion of participants during experiments in Stage 2. Full typology can be provided on request.

Two meta-groups of actors proposed by Freeman were never mentioned during either research stage: Customer advocate groups, and Political groups. Globally, meta-groups of actors were mentioned unequally during research stages. For instance, some of them were cited only once, while others like Customers or Suppliers were mentioned by almost all the participants. Additionally, some actors appear as common to almost all types of organizations, while others are much more specific to each business sector (e.g., Rating agencies, Incinerators). Nine meta-groups of actors identified in

Stage 1 were not retained in Stage 2: Assembly centers, Environmental organization, Infrastructure managers, Patent holders, Producers, Recovery centers, Standardization committees, Treatment centers, Employees, Managers, and Owners.

Participants more actively proposed new actors than new topics. Market as a meta-group of actors was proposed by managers during experiments even though its meaning is fuzzy.

Table 2 shows the resulting groups of actors for “Leader actors and Customers Groups” that were identified from our thematic analysis in Stage 1. At this level, 47 groups of actors identified in Stage 1 were not retained in Stage 2. In the other sense, managers proposed 7 groups of actors in Stage 2: Early adopters, Distribution leaders, Tier 1 suppliers, Tier 2 suppliers, Whistleblower, Certification bodies, and Professional technical centers. Specific actors in each group were nominatively identified by each organization and are not included in the table.

Table 2 Resulting groups of actors for Leader actors and Customers

Type of stakeholder / Meta-group of actors / Group of actors	Stakeholder’s theory	Stage 1 Interviews ¹	Stage 2 Experiments ²
<input type="checkbox"/> External stakeholder	✓	42	10
- Leading actors *	✓	19	5
Early adopters *	-	1	1
Innovators *	-	4	1
Market leaders *	-	4	-
Distribution leaders *	-	3	1
- Customers	✓	41	9
Customers (including potentials or prospects) *	-	3	3
B2B customers *	-	36	4
Customers of customers *	-	2	3
Final customers *	-	17	1
Consumers, users *	-	15	4

¹ Number of interviews where the group of actors was retained

² Number of experiments where the group of actors was retained

* Group of actors added or changed as result of thematic analysis

** Suggested group of actors in coding scheme but not retained during interviews and experiments

The typology of actors proposed from Stage 1 was also satisfactorily validated during Stage 2. Neither the structure nor the contents were questioned during experiments where participants retained 72.5% of the actors identified in Stage 1. This suggests a good relevancy of the proposed typology of actors to the information needs of organizations in terms of ES for SSC.

Discussion and conclusions

In this research we identified two typologies of topics and actors to help managers identify their information needs in ES for SSC. Resulting typologies should not be considered exhaustive but comprehensive and actionable ones. In practice, they can be adapted to the context and priorities of each organization.

All three dimensions of SD are represented in resulting typology of topics. However, its contents can be organized slightly differently from the SD triple bottom line representation as shown in Figure 2. “Environmental” and “Social” pillars are present, but the Economical pillar is replaced by “Logistics” which is consistent with the focus of this research.

“Regulation” emerged as an essential pillar that is transversal to all others whereas it was more diffuse in the literature. This meta-topic was ever-present in Stages 1 and 2. Consequently, the integration of SD in supply chains seems to depend

onevolutions of regulations. Even if some interviewees and experiment participants start SSC initiatives by their own commitment [29], [30], conformity to existing and future laws was the issue retained by most of them under this dimension. If the aim is to accelerate a reactive interaction between SD and supply chains, legislation must be developed first [19].

It comes as no surprise that the topic “Transport” from the “Environment” meta-topic emerges as one of the most important in ES for SSC. In this case, both interviewees and participants were particularly interested in following two sub-topics: “Optimization of physical flows” and “Sustainable modes of transport”. These two concerns correspond to evolutions located between logistical and environment zones. Other topics systematically retained under “Environment” by participants were "Emissions", "Energy", "Products and services" and "Waste", all of them associated with evolutions in green manufacturing techniques [4].

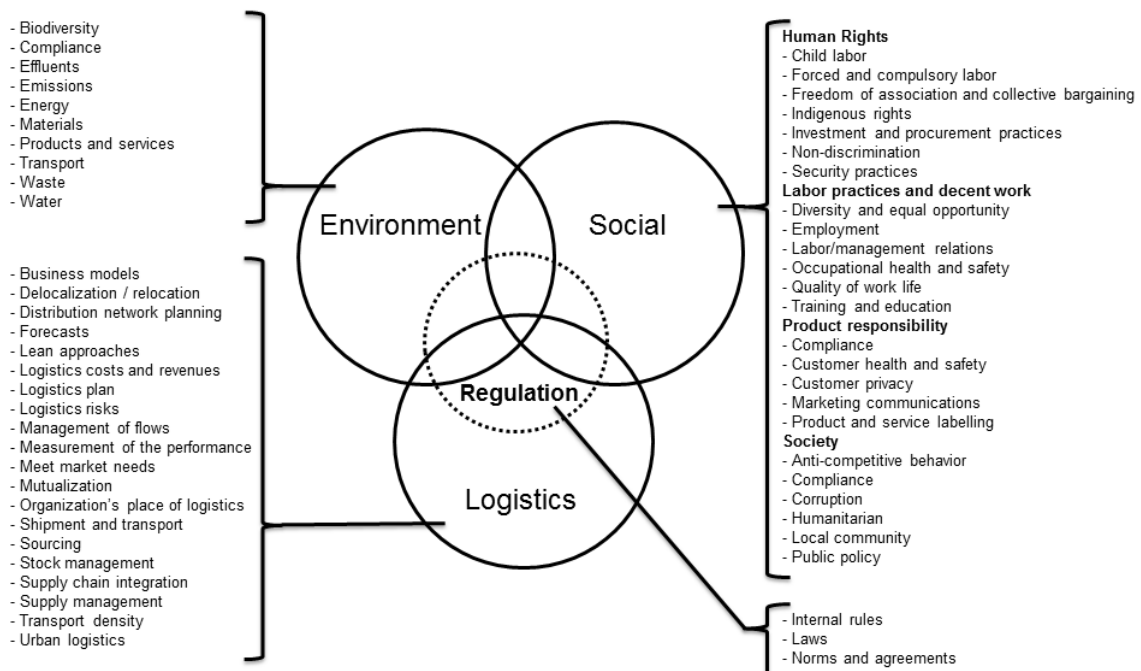


Figure 2: Sustainable Supply Chain pillars and Environmental Scanning topics

Results from the “Logistics” pillar show that participants consider as important in ES for SSC all the issues related to reconfiguring supply chains under SD considerations. Information needs correspond to internal (“Organization place of logistics”, “Logistics cost and revenues”, “Management of flows”) or external concerns (“Supply chain integration”, “Meet market needs”). Nonetheless, one of the major concerns in ES for participants was to understand the evolution of their supply chain in their value networks: what is their future place[9], [31], how SD will reconfigure their supply chain and indirectly their activity[32]-[35], and whether the reconfiguration of supply chains will drive the development of new business models[20], [36].

Concerning the "Social" pillar. In the first place, both interviewees and experiment participants predominantly retained information needs related to employees ("Quality of work life", "Training and education"). Secondly, experiment participants did not consider “local community” as an important topic in terms of information needs. This is particularly surprising because this category was regularly mentioned in the first stage of our research. This could suggest that organizations do not have a real commitment to local communities and we are confronted with a form of “social washing”. Finally, neither interviewees nor participants consider “Human rights” as an

important meta-topic in terms of information needs. This could be explained either because the organizations we met are not confronted with this problem or because they do not have the capacity to be informed about practices of their suppliers or of their suppliers' suppliers. Some people also explained that even if they would put their suppliers under surveillance, their competitors would not and thus they would lose competitiveness. Pursuing this consideration further, social aspects could be enriched by improved supply chain relationships [37], [38] or by reinforcing social public policies [30], [39].

The modifications or questions about the actors are inherently different from those concerning topics. The actors to scan are less generic than are the topics; consequently, requests to add new actors were more numerous.

The "market" was suggested and retained as an actor to scan by two organizations. The market, however, is a large and fuzzy notion that is not consistent with the definition of actors adopted in the ES academic literature. In practice, it is also hard to scan in an ES process. Future research could help specify what "market" may mean in terms of natural or physical persons, or stakeholders.

The validity of this research is conditioned to two criteria: actionability and theoretical contribution. One is an internal validity criterion according to which an actionable knowledge should be appropriable by managers and useful to help them resolve a problem they encounter in their social context [40]. The second is an external validity criterion according to which the understanding or insights the researcher develops based on his results should be carefully generalized into a theory that could potentially be used in other contexts.

During experiments, the typologies we suggested helped managers to: (1) identify their information needs, (2) identify new actors and topics they did not think of before, (3) debate about their respective information needs and define common priorities. However the use of typologies did not constrain participants. Managers were free to question, deliberate and add new topics or actors adapted to their context, or even to modify terminologies to better adapt them to their organizational language.

Also, participants in our experiments found a good match between their information needs, strategic priorities, supply chain activities, SD concerns and the suggested typologies.

Finally, the two typologies helped them obtain useful results that confirm the benefits of targeting ES identified in previous research [24] by:

- Helping decision makers specify what information they may need.
- Delimiting the part of the business environment on which to focus attention.
- Identifying common areas of interest to members of the ES process.

Experiments also showed that the participation of a facilitator is necessary to animate and guide discussions. In our study, this role was held by the researchers. As identified in previous research [22], the facilitator should be familiar with managerial expectations, qualified for his/her role, and legitimate in the eyes of the participants. Thus, further research could focus on the appropriation and utilization of these typologies by managers after the targeting meetings.

During our research process we also had difficulty finding organizations, CEOs and managers interested in SSC and ES for SSC. We conducted ten experiments, although we contacted almost a hundred organizations. Many managers explained that SSD was not a priority for their organizations. Some of them abandoned their ES project for SSD after the experiments because organizational strategic priorities had changed in the meantime, which is consistent with previous research on ES failure and

project abandonment factors [22]. Thus, further research should focus on the real importance for organizations of SSC and ES for SSC.

The aim of this study was to identify which typologies of actors and topics could characterize information needs for ES in a SSC context. The resulting typologies of topics suggest seven meta-topics: Environmental, Human rights, Labor practices and decent work, Product responsibility, Society, Regulations, and Logistics. Regulations as an emerging meta-topic was linked to the same three dimensions as SD. Logistics can be considered as a specification of an economic dimension of SD adapted to the context of this research. Concerning the actor typology, 27 new groups of actors were identified to complement Freeman's proposed ones in the context of SSC. The structure of the typologies and their content constitute new knowledge induced from practice, and their relevancy needs to be confirmed in a larger number of cases. Future research should also investigate the prioritization of actors and topics and the continuity of the application of targeting methods.

This study is the first examination of topics and actors typologies for information needs to build an ES target for SSC. It is a response to a lack of external information identified as obstacles preventing initiation of SSC projects [7], [8]. Future research is needed to study in greater depth the extensiveness, adequacy, utility and appropriation of ES projects for SSC.

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