

## Article

# Linking Cluster Characteristics and Organizational Capabilities for Sustainability—Framework Development and Application

Maria Clara da Cunha Bezerra , Cláudia Fabiana Gohr  and Sandra Naomi Morioka 

Departamento de Engenharia de Produção, Universidade Federal da Paraíba, João Pessoa 58.051-970, Brazil; sandra.morioka@academico.ufpb.br

\* Correspondence: mariaclarabezerra@hotmail.com (M.C.d.C.B); claudiagohr@ct.ufpb.br (C.F.G.);

Tel.: +55-83-3216-7549 (C.F.G.)

**Abstract:** Despite previous research in the literature indicating the relationship between corporate sustainability, organizational capabilities and industrial clusters, this interconnection has not yet been satisfactorily explored and requires further investigation. Therefore, this paper proposes a theoretical framework that relates five cluster characteristics (CC) in developing seven Organizational Capabilities for Sustainability (OCS), which are identified in the literature review. To refine the theoretical framework, seven companies were inserted in a Brazilian footwear cluster. Out of the 29 proposed relationships in the theoretical framework, 16 were evidenced and they generated our research propositions. This study primarily expands the literature by providing theoretical and empirical evidence for the role that clusters can have in enabling companies to develop OCS and in turn improve their corporate sustainability.

**Keywords:** corporate sustainability; organizational capabilities for sustainability; clusters; capabilities



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## 1. Introduction

The necessity for organizations to take environmental and social issues into account when seeking higher economic performance is debated broadly in the literature [1–4]. Given this context, corporate sustainability is gaining increased prominence among managers and researchers.

Hart [5] signaled that sustainability challenges would be paramount for companies developing organizational resources and capabilities. Following Hart's research, several authors began relating the development of specific company capabilities with sustainability [6–9] revealing that this line of thinking has gained strength over the years. Annunziata, Pucci, Frey and Zanni [10] argue that sustainability-oriented companies must identify and develop specific capabilities rooted in their organization to implement practices that create competition in a market that is increasingly aware of sustainability.

Although a body of knowledge about organizational capabilities for sustainability exists, authors have recently discussed the need for increased research in this area [1,2,11–14]. Organizational capabilities for sustainability (OCS) literature has predominantly focused on individual companies thus far [1], neglecting the moderating role of companies' environmental characteristics and their interrelationships when they implement sustainable initiatives [15]. Galdeano-Gómez, Céspedes-Lorente and Martínez-del-Río [15] signal that findings on the external effects on companies that achieve competitive advantages based on their environmental capabilities have important implications for future research both in the field of environmental management strategy and in studies on interorganizational networks, such as industrial clusters.

In interorganizational network studies, much of the OCS research has focused on supply chain type networks [16–19]. In examining industrial clusters, because so few studies have addressed OCS, only three studies can be cited. For example, Hilliard and

Jacobson [20] explored whether companies in clusters could improve environmental performance by developing cleaner technologies in response to imposed regulations. They concluded that companies located in a cluster were more likely to comply with regulatory standards and possess dynamic capabilities to enhance problem solving abilities and acquire current knowledge concerning environmental issues. However, they did not ultimately find that companies located in the cluster were more likely to develop such dynamic capabilities. The authors justified this result by stating that despite geographical proximity, the studied cluster still did not exhibit strong interaction between companies.

Perez-Aleman [21] analyzed two regulatory processes (related to environmental sustainability and food safety) through a qualitative study of two clusters. The analysis showed clusters' critical role in regulatory processes since interactions at the local level helped promote understanding, interpretation and implementation of changes.

Finally, Martínez-del-Río and Céspedes-Lorente [22] integrated cluster characteristics with environmental issues to develop a model of the motivations for adopting environmental responsiveness in clusters. The authors highlighted the role of cluster mechanisms as drivers of environmental responsiveness. However, this study was limited to analyzing a specific type of capability, that is, the environmental response capability. This study presented an opportunity for further analysis on different capabilities in the same context.

To expand the research on different capabilities, Bezerra et al. [1] highlight the importance of developing research on OCS in different productive arrangements, such as industrial clusters. Clusters can be defined as a geographical concentration of related companies, institutions and other entities, which facilitate cooperation and competition [23]. Faustino, Gohr and Santos [24] found that clusters facilitate resource and capability sharing between companies.

Industrial clusters are recognized for playing a critical role in market competitiveness and economic development [23,25]. In addition to improving performance, the literature has shown that industrial clusters can also further corporate sustainability [21,22,26–28]. However, studies exploring the role clusters play in corporate sustainability are still scarce [29–31].

Thus, motivated by the relationships suggested between these research themes (corporate sustainability, organizational capabilities and industrial clusters) and seeking to fill gaps in the literature, the following research question emerges: How can industrial clusters foster the development of organizational capabilities for sustainability (OCS)? Hence, this paper proposes a theoretical framework that shows cluster characteristics' relationships in developing OCS. The literature does not present a direct method for how cluster characteristics promote OCS development. Therefore, the expected benefits of these characteristics were identified and these benefits were in turn connected with organizational capabilities for sustainability. These connections were then represented in the proposed framework. To refine the proposed framework, we conducted case studies in seven companies located in a footwear cluster in Brazil.

Thus, this research contributes to studies and business practices on industrial clusters, organizational capabilities and corporate sustainability. The proposed framework provides a theoretical background and explores empirical evidence about how cluster characteristics, which can generate benefits for companies located in clusters, contribute to developing capabilities to improve companies' sustainability.

Although the trade-off between economic growth and sustainability is inevitable, it is still relevant to study relationships between clusters and organizational capabilities and sustainability, since synergies and interdependencies exist between cluster development and sustainability [32]. We explore these synergies.

The article is structured as follows: following this introduction, Section 2 includes a literature review of cluster characteristics and OCS. From these constructs, Section 3 proposes the theoretical framework. Section 4 describes the material and methods, which applies and refines the framework using case studies. Section 5 presents results, followed by the

discussion in Section 6. Finally, Section 7 presents the studies' conclusions, contributions, limitations and opportunities for further research.

## 2. Industrial Clusters and Organizational Capabilities for Sustainability

Industrial agglomerations, treated under the name of industrial clusters, gained popularity from Porter's 1990 and 1998 works, which argued that clusters played a critical role in competitiveness and economic development, as they brought a series of benefits to companies located in them, such as competitive advantage and better performance [24,33–36].

The relational view (RV) who consider that resources and capabilities can exceed the limits of companies and can be incorporated into inter-firm routines and processes and can be sources of competitive advantage [37]. Lavie [38] extended the resource-based view (RBV) by revealing that companies interconnected in networks can exploit external resources and capabilities embedded in the alliance network and provide strategic opportunities for companies. In this sense, it is understood that companies located in industrial clusters may have their organizational capabilities strengthened, as these are influenced by the context in which they operate and by the interorganizational collaboration provided by this organizational arrangement.

Many authors are studying this phenomenon. For example, Hervas-Oliver, et al. [39] by adopting bibliometric methods to analyze the cluster literature verified that many articles on industrial clusters were concerned with managerial capabilities and absorptive capacity [40]. They focused on topics about innovation and the use of a managerial approach by which the core units of analysis were cluster firms and their strategies and capabilities to use and exploit external knowledge in order to be innovative.

Hilliard and Jacobson [20] highlighted that geographical proximity and firm-specific features determine the ability of cluster firms to respond to new challenges, such those regarding environmental ones, focusing on firms' ability to implement cleaner technology. Recently, Oliveira and Silva [41] showed how interorganizational learning and dynamic management capabilities could improve cluster performance; however, not focusing on environmental and social performance.

Almeida, et al. [42], through a systematic literature review, also demonstrated that the development of collaborative (or relational) capabilities in different business network, such as industrial clusters, could influence the adoption of sustainable strategies (especially those proposed by the natural resource-based view [5,43].

However, the authors have not studied the benefits that such capabilities could bring to companies inserted in industrial clusters. Thus, there is evidence that industrial clusters influence the development of organizational capabilities and that capabilities increase cluster performance. Organizational capabilities can be defined as skills and routines that allow organizations to perform tasks, using their base of available resources to achieve desired results [44,45].

More recently, industrial clusters had been linked to sustainability (social, environmental and economic issues) and the benefits that companies located in clusters can have on sustainability have been identified [26–28]. However, the literature is still relatively incipient when associating clusters to the development of organizational capabilities with a focus on sustainability.

Since this study seeks to cover this research gap, a thorough literature analysis was developed, both focused on classic and general research on industrial clusters and studies about clusters in the context of sustainability. Therefore, it was possible to identify five aspects that characterize a cluster. These five characteristics are: Geographical proximity of companies (CC1); Local level interactions and collaboration; formal and informal associations and networks (CC2); Associations/interactions with support institutions (public and private companies) (CC3); Competition stimulus (CC4); and Identity / sociocultural factors (CC5). Table 1 associates these characteristics with their benefits, which are detailed in the literature.

**Table 1.** Cluster characteristics and their potential associated benefits.

Cluster Characteristics					Possible Benefits	Authors
CC1	CC2	CC3	CC4	CC5		
•	•	•		•	B1: Information and knowledge sharing; knowledge spillovers; learning; experiences; absorption of knowledge; know-how.	[7,15,21–23,25–28,46–52]
•	•	•			B2: Collective action to address challenges; sharing solutions; joint management of shared equipment and services.	[21,27–29,49,52]
•	•	•	•	•	B3: Support for innovation; technology; continuous innovation; creativity.	[21,23,25–29,47–50]
•		•	•		B4: Reputation; improvement in marketing; customer attraction; better communication.	[15,22,23,27,50,52]
•					B5: Access to intensive/qualified labor, specialized suppliers; flow of employees.	[15,23,29,49,50,52]
•	•	•	•	•	B6: Flexibility to act quickly; responsiveness of companies; responsiveness to market changes/adaptation.	[21–23,26,29,49,52]
•	•	•	•		B7: Facilitate the flow of resources; improve products and processes; short-term/fast operations; specialized services; reduced transaction costs; process efficiencies.	[21,22,25,27,29,49,52]
	•	•	•		B8: Training programs; infrastructure; shared vision to face challenges; training; motivation.	[21–23,28,49]
				•	B9: Trust.	[28]

The literature agrees that developing organizational capabilities can significantly influence company sustainability and different types of organizational capabilities for sustainability (OCS) have been studied [1,7,9,17,53]. One recent study based on a systematic literature review compiles academic knowledge of OCS and identifies seven OCS categories [1]. These categories are (1) capabilities related to collaborative relationships for sustainability (OCS1), (2) capabilities related to the absorption of knowledge/learning about sustainability (OCS2), (3) capabilities related to innovation/technology for sustainability (OCS3), (4) capabilities related to alignment/motivation for sustainability (OCS4), (5) capabilities related to marketing/external communication for sustainability (OCS5), (6) capabilities related to flexibility/adaptation of sustainable issues (OCS6) and (7) capabilities related to managing sustainable operations (OCS7).

### 3. The Proposed Theoretical Framework: Relating Cluster Characteristics to the Development of Organizational Capabilities for Sustainability

The five cluster characteristics mentioned in Section 2 were related to the OCS found in Bezerra, et al. [1]. This study explores which of these characteristics influence OCS development. The form of association developed in this research is through the perception of benefits arising from the cluster characteristics that mediate this relationship with the OCSs.

In this context, the geographical proximity of companies is used as an example. This cluster characteristic can facilitate information and knowledge sharing; knowledge spillovers; learning; experiences; absorption of knowledge and know-how (see “B1” in Table 2). Therefore, this characteristic can influence the development of capabilities related to the absorption of knowledge/learning about sustainability capabilities because it is linked to the absorption of knowledge and learning for sustainability (OCS2).

Based on this rationale, a theoretical framework is proposed, linking cluster characteristics (CC) and organizational capabilities for sustainability (OCS). Figure 1 presents this theoretical framework, which visualizes the relationships between CC and the OCS identified in the literature.

Table 2. Case study company characteristics.

Characteristics of Companies	Case Study Companies						
	A	B	C	D	E	F	G
Founding year	1994	2000	2006	1978	2006	1998	2005
Number of employees	59	10	29	8000	32	15	18
Company size	Small	Micro	Small	Large	Small	Micro	Micro
Main products	Line of men’s footwear	Line of women’s footwear	Slippers; Personalized slippers Sandals; Soles	Footwear and sporting goods	Children’s footwear	Men’s footwear and sports equipment	Women’s footwear, bags and accessories

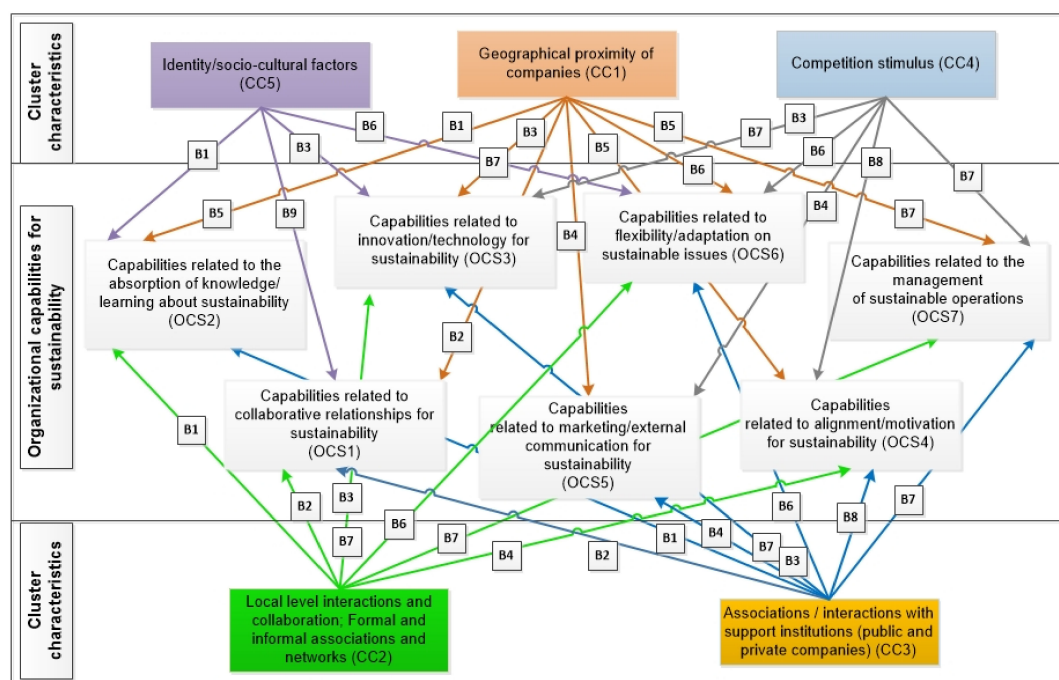


Figure 1. Theoretical framework linking cluster characteristics and organizational capabilities for sustainability. **Note:** B1: Information and knowledge sharing; knowledge spillovers; learning; experiences; absorption of knowledge; know-how; B2: Collective action to address the challenges; sharing solutions; joint management of shared equipment and services; B3: Support for innovation; technology; continuous innovation; creativity; B4: Reputation; improvement in marketing; Customer attraction; Better communication; B5: Access to intensive/qualified labor, specialized suppliers; flow of employees; B6: Flexibility to act quickly; Responsiveness of companies; respond to market changes/adaptation; B7: Facilitate the flow of resources; improve products and processes; Short-term/fast operations; specialized services; reduced transaction costs; process efficiencies; B8: Training programs; infrastructure; shared vision to face challenges; training; motivation; B9: Trust.

#### 4. Materials and Methods

To answer our research question, we proposed a theoretical framework that relates cluster characteristics and OCS development. To refine it, we applied a case study as our primary research method, from which we generated research propositions. Using a case study is appropriate in the early stages of research on a topic, thereafter, information derived from an in-depth empirical investigation [54] is desirable in developing a theory or theme [55].

This research performs multiple case studies in seven companies operating in a footwear cluster situated in Brazil (as explained below). According to Eisenhardt and Graebner [56], multiple case studies create a more robust theory, which more precisely delineates constructs and allows propositions to be developed based on varied empirical evidence.

##### 4.1. Case Selection

In order to select a cluster, we used the following criteria: (i) to be an economically representative cluster for the State and Brazil; and, (ii) having companies that adopted initiatives focused on sustainability. Thus, we contacted the state nucleus coordinator for supporting clusters and Sebrae (Brazilian Support Service for Micro and Small Enterprises), which is an organization that maps clusters in each of Brazil's states. Thus, we selected the footwear cluster located in the Northeast of Brazil that is part of the PROMOS project, which attempts to implement the Italian industrial district model in Brazilian clusters [57].

The footwear sector has relevant economic and social importance for the country, accounting for 4% of the GDP of the Brazilian Manufacturing Industry. Brazil was the fourth-largest producer of footwear in the world in 2019 [58]. In numbers, the country's footwear sector generates more than 270 thousand direct jobs, produced 944 million pairs of shoes in 2018 and exported 115 billion pairs of shoes in 2019 [58]. Among businesses in the country that produce the most significant amounts of footwear, the cluster where the companies are inserted is the second-largest producer of footwear in its region [59].

Given how this sector is representative of the country's larger economy, studies that include socio-environmental sustainability in footwear production are crucial. Footwear production can create a distressing amount of waste materials, such as plastic, rubber, synthetic material, leather and textile, among others.

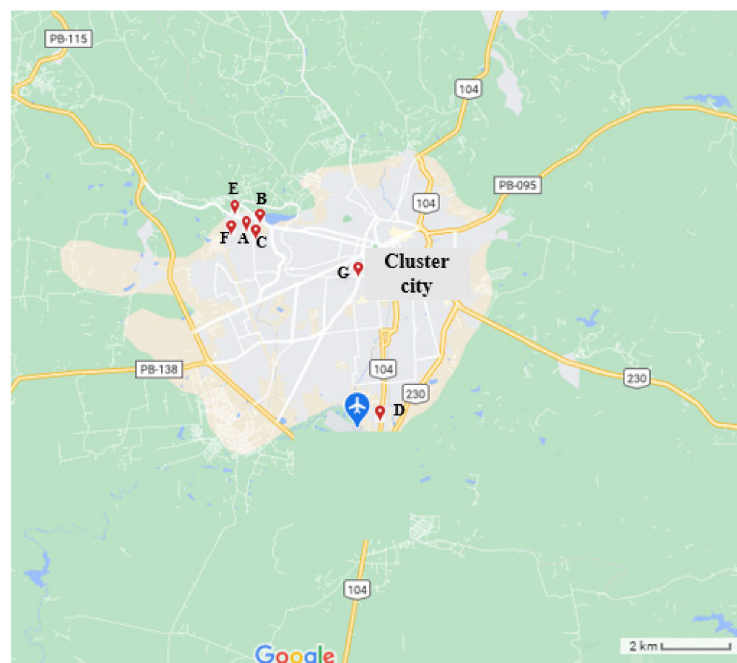


Figure 2. Location of companies in the cluster.

The companies' selection criteria were that they displayed actions linked to environmental and/or social sustainability. Again, we contacted the state nucleus coordinator for supporting clusters and Sebrae and they directed the most suitable companies for the study. Seven companies, featuring multiple case studies, were selected for our research since we expected this size group to have a higher degree of consistency in its results [54]. Table 2 details a summary of company information. The size of the companies was defined based on the classification of the Brazilian Institute of Geography and Statistics - IBGE. Figure 2 provides a map with the locations of the companies studied, which allows a better picture of the cluster and how these companies fit in.

#### 4.2. Data Collection and Analysis

We primarily used semi-structured interviews to collect data [54] and unsystematic observation (carried out during interviews) as well as cluster documents and records. We selected interviewees if they were managers or worked directly in sustainability management or decision-making.

Prior to data collection, we developed a research protocol to guide researchers in data collection [54]. A semi structured interview script was also developed based on the proposed framework (Figure 1). We used a pilot test to refine this script, which a researcher who specializes in cluster and corporate sustainability conducted. We conducted this pilot test to improve the script and make it easier for managers to understand it.

The interview script was divided into two main stages. In the first stage, questions addressed the company's OCS. In the second stage, the questions concerned CC in order to identify which of the OCS and CC fit in the studied cluster's context. In this stage, candidates were encouraged to think not only about their company individually but also about the cluster as a whole, specifically how the companies within the cluster interact with one another. When asking about each CC, we sought to relate it to its respective OCS.

The interviews occurred between the months of October and November 2018. All interviews were fully recorded, transcribed and coded. The interviews were coded and analyzed in a multiple case study database, using Atlas.ti 6.0 software, GmbH, Berlin, Germany. The codes created in the software refer to the constructs that form the research framework. Each code was assigned to a data segment from the transcribed interviews in order to discover patterns and relationships between the interviewees' responses concerning OCS and CC as well as to make associations between codes. Initially, cross-case analysis was performed for CC. Then, within-case analysis and cross-case analysis were performed for OCS.

Finally, OCS and CC findings are compared with one other in order to identify which relationships in the proposed framework occur in the empirical context we analyzed. At this point, literature review findings are also compared with empirical study results. This analysis allowed us to generate research proposals and refine the theoretical framework initially proposed. To ensure information accuracy, we developed a technical report, which we sent to the companies participating in the study.

## 5. Results

### 5.1. Footwear Cluster Description

The footwear cluster in this study is located in northeastern Brazil. It originated from livestock activities in the Region, mainly cotton. From the 1940s on, tannery activities appeared, initially intended for making saddles for riding. However, the existence of a cattle, sheep and goat herd in the region and tannery activities created the preconditions for the production of shoes and the like leather [60].

Brazil consolidated itself as an important shoe supplier for the world market in the 1970s when the product acquired relevance in the national export basket. At that time, large Brazilian footwear companies were located mainly in the south and southeast of the country.

However, in the 1990s, changes occurred in the production conditions and the competition pattern of the international market, caused severe difficulties for the Brazilian

industry, which had specialized in the production of low-cost shoes and was unable to compete [61,62]. In this sense, shoe production in Brazil began to move to the northeast of the country, stimulated by lower costs, government incentives and the favorable position of the region concerning the main external consumer markets [61–63].

The footwear cluster in this study is among the main footwear hubs in the country [59]. There is a historical vocation in the city where the cluster for the production of shoes is located, where a large number of shoemakers and informal producers are located, most companies are characterized by family learning and experience passed from father to son [60].

### 5.2. Cluster Characteristics and OCS Analysis

The five cluster characteristics from the literature (Table 1) were evidenced in the studied cluster. However, their degrees of presence were assessed at different levels, which Table 3 shows.

**Table 3.** Degrees of presence of footwear cluster characteristics analyzed.

Characteristics of Clusters	Importance in the Cluster
CC1: Geographical proximity of companies	ST
CC2: Local level interactions and collaboration; formal and informal associations and networks	ST
CC3: Associations/interactions with support institutions (public and private companies)	ST
CC4: Competition stimulus	MO
CC5: Identity/sociocultural factors	ST

ST: Strong characteristic MO: Moderate characteristic WE: Weak characteristic analysis.

All companies are relatively close to each other (CC1), which facilitates interaction and collaboration (CC2). Five of the companies are located in an industrial pole, where interaction is even more robust due to greater proximity. The remaining companies are located in nearby neighborhoods.

The presence of important institutional actors—such as S System—are also worth noting in the cluster development process (CC3). The S system is a set of corporate institutions focused on professional training, research and technical and social assistance. It includes the leather and footwear school, the Federal University, Fiep (Federation of Industries of the State of Paraíba) as well as other educational, technological and research institutions. All seven companies agree that these institutions hold great value for the cluster.

We also verified that moderate competition exists between the companies we studied, since they do not compete in the same market due to segmentation of product lines and a diversified set of target customers (CC4). Finally, the cluster has a robust historical and cultural identity for the region into which it is inserted (CC5).

Appendix A presents a detailed table with descriptions of the degree to which each characteristic was evaluated, followed by detailed evidence from the case studies that determined each evaluation. This evidence was corroborated by most of the companies studied, which demonstrates a consensus among companies about the specificities and the functioning of the cluster in which they are inserted.

The seven OCS were also analyzed and evaluated according to their degree of presence in the companies studied (Table 4). Appendix A includes the detailed empirical evidence.

In the companies we examined, we verified that most OCS occur moderately. This finding is supported by the fact that if companies have measures that impact sustainability, these measures often indirectly correlate with corporate strategies aimed at improving overall performance. On the other hand, OCS5 (capabilities related to marketing/external communication for sustainability) is considered nonexistent in most companies because they do not exhibit sustainability-oriented marketing strategies, such as socially responsible products, brands linked to sustainability and so forth.



**Table 4.** Summary of studied companies' Organizational Capabilities for Sustainability (OCS).

Companies	Organizational Capabilities for Sustainability						
	OCS1	OCS2	OCS3	OCS4	OCS5	OCS6	OCS7
A	MO	MO	MO	WE	NO	MO	MO
B	MO	MO	WE	MO	NO	MO	WE
C	MO	MO	MO	WE	NO	MO	MO
D	ST	ST	ST	MO	MO	ST	ST
E	MO	MO	MO	MO	NO	MO	MO
F	MO	MO	MO	MO	NO	MO	MO
G	MO	MO	MO	WE	NO	MO	WE

ST: Strong capability MO: Moderate capability WE: Weak capability NO: Nonexistent capability; OCS1: capabilities related to collaborative relationships for sustainability; OCS2: capabilities related to the absorption of knowledge/learning about sustainability; OCS3: capabilities related to innovation/technology for sustainability; OCS4: capabilities related to alignment/motivation for sustainability; OCS5: capabilities related to marketing/external communication for sustainability; OCS6: capabilities related to flexibility/adaptation of sustainable issues; OCS7: capabilities related to managing sustainable operations.

The OCS in most companies we studied (A, B, C, E, F and G) show similar degrees of development. This finding may be because they are inserted in an industrial cluster, which allows them each to receive the same support from government and supporting institutions; negotiate with the same suppliers and customers; and interact with one another since they are in close proximity [23].

We should note that Company D is the only company with higher OCS levels. This is because Company D is the only large company and as a result, it has different characteristics from the other companies, such as its ability to negotiate with different suppliers and customers, it possessing increased government support and so forth.

### 5.3. Relationships between Cluster Characteristics and OCS

Once the cluster characteristics and the OCS of the companies we studied were identified, this information was crossed in order to explore relationships in the proposed framework (Figure 1). Tables 5–8 below summarize the relationships found; each table is dedicated to a cluster characteristic. Column 2 of each table shows the benefits that mediated these relationships and Column 3 shows empirical evidence for each characteristic. Column 4 presents theoretical evidence corroborating these findings. Finally, Column 5 shares the propositions generated from the empirical and theoretical evidence.

No proposition is developed for OCS5 (capabilities related to marketing/external communication for sustainability) because the empirical evidence was only verified for Company D, which received competitive pressure related to green marketing mainly by companies outside the cluster and not within it. Finally, although the literature asserts that CC5 (identity/sociocultural factors) influences the generation of several benefits (B1, B3, B6 and B9) and that they may be linked to developing OCS, the empirical data did not support this conclusion.

**Table 5.** Relationships between CC1 (geographical proximity of companies) and OCS.

Related OCS	Linked Benefit	Empirical Evidence	Theoretical Evidence	Propositions
OCS1	B2	Facilitating joint meetings and training to address issues related to sustainability (e.g., developing more sustainable products and processes, waste reduction, process optimization, correct disposal of inputs, worker safety, environmental standards, etc.) (companies A, B, C, E, F and G).	The collective action strongly present in clusters can provide companies with a clearer path to sustainability, since collaboration is seen as a crucial means for solving sustainability challenges [26,64–66]	(P1a): CC1 is related to developing capabilities in collaborative relationships for sustainability (OCS1).
OCS2	B1	Facilitating meetings between companies allows the exchange and absorption of sustainable information (companies A, B, C, E and F). (e.g., supplier information for purchasing recycled material and products that have less of an impact on workers' health, etc.).	Proximity allows for the exchange of information and knowledge that enrich the local context and simultaneously encourage workers to share information [28].	(P1b): The CC1 is related to developing capabilities in knowledge absorption/learning about sustainability (OCS2).
	B5	Specialized suppliers offer lectures and produce more sustainable products (e.g., solar energy, water-based glue) (A, B, C, E and G).	Proximity is a means of more easily obtaining suppliers and service providers as they try to penetrate more aggressively in a concentrated market due to efficiency gains in productivity and marketing [23,29,52].	
OCS6	B6	Jointly issued environmental licenses (companies A, B, C, E and F).	Business proximity can make it easier to more quickly implement necessary changes [23]. Companies in a cluster face the same environmental problems, so they can develop and share solutions at the territorial level [27].	(P1c): The CC1 is related to developing capabilities in flexibility/adaptation to sustainable issues (OCS6).
OCS7	B7	Input loans between companies (A, B, C, E, F and G). Purchase policies and sale of inputs between some companies in the cluster (Companies E and F) and joint purchases (companies A, E, F and G). Policies that reduce carrier wait times or companies' displacement from suppliers and impact the reduction of fossil fuel emissions.	Collective action through associations can help reduce transaction costs (due to trusted relationships among companies) [25]. Economies of scale can result from joint actions and shared services as companies negotiate jointly with the same suppliers, increasing companies' bargaining power [27].	(P1d): The CC1 is related to developing capabilities in managing sustainable operations (OCS7).

OCS1: capabilities related to collaborative relationships for sustainability; OCS2: capabilities related to the absorption of knowledge/learning about sustainability; OCS6: capabilities related to flexibility/adaptation of sustainable issues; OCS7: capabilities related to managing sustainable operations. B1: Information and knowledge sharing; knowledge spillovers; learning; experiences; absorption of knowledge; know-how; B2: Collective action to address the challenges; sharing solutions; joint management of shared equipment and services; B3: Support for innovation; technology; continuous innovation; creativity; B4: Reputation; improvement in marketing; Customer attraction; Better communication; B5: Access to intensive/qualified labor, specialized suppliers; flow of employees; B6: Flexibility to act quickly; Responsiveness of companies; respond to market changes/adaptation; B7: Facilitate the flow of resources; improve products and processes; Short-term/fast operations; specialized services; reduced transaction costs; process efficiencies; B8: Training programs; infrastructure; shared vision to face challenges; training; motivation; B9: Trust.

**Table 6.** Relationships between CC2 (local level interactions and collaboration; formal and informal associations and networks) and OCS.

Related OCS	Linked Benefit	Empirical Evidence	Theoretical Evidence	Propositions
OCS1	B2	Interactions allow for collective actions such as periodic meetings, training and joint lectures where topics related to sustainability are addressed (companies A, B, C, E, F and G).	Companies that interact in the same area and face similar problems are able to jointly address challenges, implement changes and develop and share solutions [21,29,52].	(P2a): CC2 is related to developing capabilities in collaborative relationships for sustainability (OCS1).
OCS2	B1	Interactions facilitate formal and informal meetings between companies that allow for the exchange and absorption of sustainable information (companies A, B, C, E, F and G).	Companies can acquire knowledge and experience from interactions with other companies on sustainable issues [15,22]. Interactions between companies foster trust and facilitate the flow of information [23].	(P2b): CC2 is related to developing capabilities in absorbing knowledge/learning about sustainability (OCS2).
OCS6	B6	Jointly issued environmental licenses (companies A, B, C, E and F) are made possible by the geographical proximity and strong interactions between companies.	The significant interactions between companies allow them to jointly overcome challenges and implement actions, such as meeting market demands and adhering to new requirements and regulations [21,29,52].	(P2c): CC2 is related to developing capabilities in flexibility/adaptation to sustainable issues (OCS6).
OCS7	B7	Policies (previously mentioned in Table 6, Line 5) that reduce carrier times or companies' displacement from the supplier and impact the reduction of fossil fuel emissions.	Interactions between companies also contribute to reducing transaction costs [25] and providing greater economies of scale [27].	(P2d): CC2 is related to developing capabilities in managing sustainable operations (OCS7).

OCS1: capabilities related to collaborative relationships for sustainability; OCS2: capabilities related to the absorption of knowledge/learning about sustainability; OCS6: capabilities related to flexibility/adaptation of sustainable issues; OCS7: capabilities related to managing sustainable operations. B1: Information and knowledge sharing; knowledge spillovers; learning; experiences; absorption of knowledge; know-how; B2: Collective action to address the challenges; sharing solutions; joint management of shared equipment and services; B3: Support for innovation; technology; continuous innovation; creativity; B4: Reputation; improvement in marketing; Customer attraction; Better communication; B5: Access to intensive/qualified labor, specialized suppliers; flow of employees; B6: Flexibility to act quickly; Responsiveness of companies; respond to market changes/adaptation; B7: Facilitate the flow of resources; improve products and processes; Short-term/fast operations; specialized services; reduced transaction costs; process efficiencies; B8: Training programs; infrastructure; shared vision to face challenges; training; motivation; B9: Trust.

**Table 7.** Relationships between CC3 (associations/interactions with support institutions (public and private companies) and OCS.

Related OCS	Linked Benefit	Empirical Evidence	Theoretical Evidence	Propositions
OCS1	B2	Actions developed by the S System (e.g., events, meetings, trainings, lectures and fairs), which cover topics, including sustainability (Companies A, B, C, D E, F and G). During fairs, the government's role was highlighted alongside Sebrae's, who each provided subsidies. The government also created a cluster development program and financed footwear pole construction, which improved the proximity of companies in the cluster, thereby strengthening collaborative relationships.	Collaboration of companies with other actors is important for sustainability, since environmental issues are not paramount in most companies. Companies do not generally have the necessary knowledge and skills to achieve sustainability, so they must seek such skills outside their domains [64].	(P3a): CC3 is related to developing capabilities in collaborative relationships for sustainability (OCS1).

Table 7. Cont.

Related OCS	Linked Benefit	Empirical Evidence	Theoretical Evidence	Propositions
OCS2	B1	The described actions developed by System S also allow companies to absorb information related to sustainability.	Collective support and connections between companies and public and private actors lead to shared know-how, which in turn facilitates knowledge construction [21].	(P3b): CC3 is related to developing capabilities in absorbing knowledge/learning about sustainability (OCS2).
OCS4	B8	Lectures, courses and training developed by System S institutions with a focus on sustainability are aimed at both managers and employees of companies to raise all employees' environmental/social awareness, qualifications and motivation. The leather and footwear school develop labor that is working or will be working in cluster companies (Companies A, B, C, D, E, F and G).	Lectures and training, developed by institutions that support clusters [23,28], complement existing employee knowledge [67]. Employee knowledge is important, since employees play a crucial role in the company's ability to achieve sustainability goals [7,17,64,68].	(P3d): CC3 is related to developing capabilities in alignment/motivation for sustainability (OCS4).
OCS6	B6	System S support helps companies to adapt and implement changes, such as meeting environmental/social regulations; providing lectures by suppliers that present environmentally responsible products; and facilitating programs aimed at promoting and preserving employee health, such as PPRA (Environmental Risk Prevention Program) and PCMSO (Occupational Health Medical Control Program) (Companies A, C, F and G).	Significantly, interactions between companies and support institutions jointly address challenges and implementing actions, such as market demands, new requirements and regulations [21,29,52].	(P3e): CC3 is related to the development of capabilities in flexibility/adaptation on sustainable issues (OCS6).
OCS7; OCS3	B7	S system institutional trainings focus on productivity, use of raw materials, labor and personnel training. The leather and footwear school provide services to cluster companies, focusing on developing new footwear models, using new processes and technologies, etc. (Company A, B, C, D, E, F and G). The city's university supports these endeavors primarily through a design course that focuses on reusing materials and developing new models (Companies A, E and F). All of these process and product improvements indirectly influence sustainability.	Technological innovations that aim at efficiencies in production, delivery, cost reduction, resource integration and those that affect companies' sustainability may result from collaborative partnerships, involving both central companies and public-private partnerships, such as Research Institutes [28]. Relationships with other entities within the cluster help companies learn about technology [23].	(P3c): CC3 is related to developing capabilities in innovation/technology for sustainability (OCS3). (P3f): CC3 is related to developing capabilities in the management of sustainable operations (OCS7).

OCS1: capabilities related to collaborative relationships for sustainability; OCS2: capabilities related to the absorption of knowledge/learning about sustainability; OCS3: capabilities related to innovation/technology for sustainability; OCS4: capabilities related to alignment/motivation for sustainability; OCS7: capabilities related to managing sustainable operations. B1: Information and knowledge sharing; knowledge spillovers; learning; experiences; absorption of knowledge; know-how; B2: Collective action to address the challenges; sharing solutions; joint management of shared equipment and services; B3: Support for innovation; technology; continuous innovation; creativity; B4: Reputation; improvement in marketing; Customer attraction; Better communication; B5: Access to intensive/qualified labor, specialized suppliers; flow of employees; B6: Flexibility to act quickly; Responsiveness of companies; respond to market changes/adaptation; B7: Facilitate the flow of resources; improve products and processes; Short-term/fast operations; specialized services; reduced transaction costs; process efficiencies; B8: Training programs; infrastructure; shared vision to face challenges; training; motivation; B9: Trust.

**Table 8.** Relationships between CC4 (competition stimulus) and OCS.

Related OCS	Linked Benefit	Empirical Evidence	Theoretical Evidence	Propositions
OCS3; OCS7	B3; B7	<p>Actions that improve and increase innovations in products and processes with a focus on profitability and competitiveness, which indirectly impact sustainable issues, e.g.:</p> <ul style="list-style-type: none"> <li>• using recycled material as a product input (A, C and E);</li> <li>• completely reusing material in the production process for injection molding machines (waste reduction) (A, C, E and F);</li> <li>• improving production processes to increase conformity and competitiveness (e.g., sustainable management of solid waste, water reuse, capturing solar energy for parking, waste transformation and developing a sustainability supply chain) (Company D);</li> <li>• eliminating the use of synthetic material in a shoe model (Company C);</li> <li>• replacing leather with fabric as the main input in shoe, bag and accessory production;</li> <li>• developing a line of colored cotton products in association with a local cooperative (Company G).</li> </ul>	Rivalry plays an essential role in clusters, as companies seek to generate resources in order to outperform competitors [22,23]. Increased performance is made easier as clusters also allow companies to compare their rivals' performance to their own [23]. Thus, companies in a cluster are motivated to increase their competitive capabilities compared with companies not integrated into a cluster [22,23].	(P4a): CC4 is related developing capabilities in innovation/technology for sustainability (OCS3). (P4b): CC4 is related developing capabilities in managing sustainable operations (OCS7).
OCS5	B4	Company D develops collections related to sustainability, treating this action as a business differential.	Companies under competitive pressure are motivated to develop marketing skills [22].	X

OCS1: capabilities related to collaborative relationships for sustainability; OCS2: capabilities related to the absorption of knowledge/learning about sustainability; OCS6: capabilities related to flexibility/adaptation of sustainable issues; OCS7: capabilities related to managing sustainable operations. B1: Information and knowledge sharing; knowledge spillovers; learning; experiences; absorption of knowledge; know-how; B2: Collective action to address the challenges; sharing solutions; joint management of shared equipment and services; B3: Support for innovation; technology; continuous innovation; creativity; B4: Reputation; improvement in marketing; Customer attraction; Better communication; B5: Access to intensive/qualified labor, specialized suppliers; flow of employees; B6: Flexibility to act quickly; Responsiveness of companies; respond to market changes/adaptation; B7: Facilitate the flow of resources; improve products and processes; Short-term/fast operations; specialized services; reduced transaction costs; process efficiencies; B8: Training programs; infrastructure; shared vision to face challenges; training; motivation; B9: Trust.

## 6. Discussion

Table 9 summarizes the relationships found between cluster characteristics and organizational capabilities for sustainability. The darker the color in the color scale, the more closely the companies align with the evidence. From the discussions presented and the propositions developed in Figure 1, the theoretical framework was refined, as shown in Figure 3.

**Table 9.** Relationships identified between footwear cluster characteristics and companies' OCS.

Cluster Characteristics	Organizational Capabilities for Sustainability (OCS)						
	OCS1	OCS2	OCS3	OCS4	OCS5	OCS6	OCS7
CC1: Geographical proximity of companies (FO)	A, B, C, E, F and G	A, B, C, E, F and G				A, B, C, E and F	A, B, C, E, F and G
CC2: Local level interactions and collaboration; formal and informal associations and networks (FO)	A, B, C, E, F and G	A, B, C, E, F and G				A, B, C, E and F	A, B, C, E, F and G
CC3: Associations/interactions with support institutions (public and private companies) (FO)	A, B, C, E, F and G	A, B, C, D, E, F and G	A, E and F	A, B, C, D, E, F and G		A, C, E, F and G	A, E and F
CC4: Competition stimulus (MO)			A, B, C, D, E, F and G		D		A, B, C, D, E, F and G
CC5: Identity/sociocultural factors (FO)							

OCS1: capabilities related to collaborative relationships for sustainability; OCS2: capabilities related to the absorption of knowledge/learning about sustainability; OCS3: capabilities related to innovation/technology for sustainability; OCS4: capabilities related to alignment/motivation for sustainability; OCS5: capabilities related to marketing/external communication for sustainability; OCS6: capabilities related to flexibility/adaptation of sustainable issues; OCS7: capabilities related to managing sustainable operations.

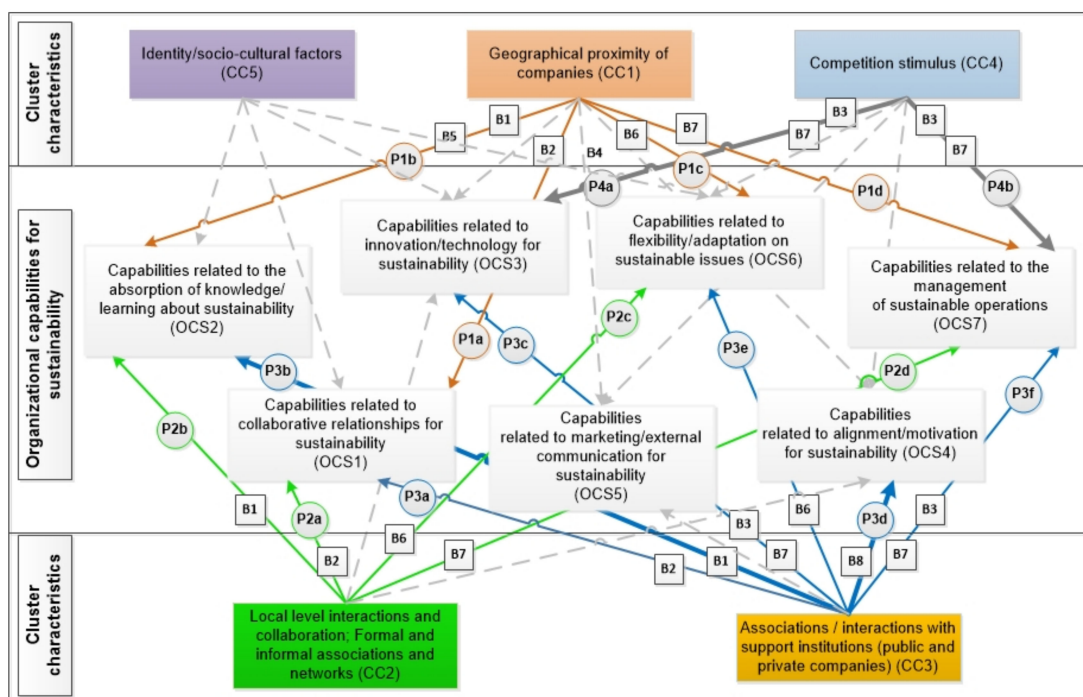
As displayed in Figure 3, 16 out of the 29 proposed relationships in the theoretical framework were evidenced in the empirical study. Stronger lines signal relationships that empirical findings fully corroborated. Weaker lines indicate that empirical findings partially corroborated relationships, as they were not evidenced in all companies in the case study. Finally, dashed lines show the relationships in the theoretical framework for which the empirical study did not provide evidence.

The characteristic showing the most relationships for developing OCS is CC3 (associations/interactions with support institutions, public and private companies), which has six relationships. An existing cluster development program and institutions supporting it caused this finding. CC5 (identity/sociocultural factors), despite being a strong characteristic, is the only characteristic in which it was not possible to verify relationships with OCS. This finding is due to this characteristic currently emphasizing aspects of reputation and market performance over sustainability.

However, since corporate sustainability is a worldwide trend, companies are increasingly considering needs beyond their economic, environmental and social pillars to remain competitive. In this sense, if companies in the cluster want to survive competition, sustainability could be a way to gain an edge over other companies. Because CC5 (identity/sociocultural factors) is a strong characteristic in the studied cluster, it will be an important factor in achieving greater sustainability. In general, most propositions were not evidenced in all companies in the case study as Table 9 shows.

It should be noted that only propositions P3b, P3d, P4a and P4b are strongly based on empirical findings, since these relationships were identified in all of the companies studied. They still cannot be fully generalized, since they have been explored in a specific context. However, this does not detract from the relationships established in the other propositions, especially P1a, P1b, P1c, P2a, P2b, P2c and P3a. Such evidence was not found in Company

D, which besides being geographically more distant from the other studied companies, is a large company, which hinders collaborative relationships.



**Figure 3.** Refined Framework. **Note:** B1: Information and knowledge sharing; knowledge spillovers; learning; experiences; absorption of knowledge; know-how; B2: Collective action to address the challenges; sharing solutions; joint management of shared equipment and services; B3: Support for innovation; technology; continuous innovation; creativity; B4: Reputation; improvement in marketing; Customer attraction; Better communication; B5: Access to intensive/qualified labor, specialized suppliers; flow of employees; B6: Flexibility to act quickly; Responsiveness of companies; respond to market changes/adaptation; B7: Facilitate the flow of resources; improve products and processes; Short-term/fast operations; specialized services; reduced transaction costs; process efficiencies; B8: Training programs; infrastructure; shared vision to face challenges; training; motivation; B9: Trust.

In this sense, we can highlight the size of the company as an intervening factor in the relationship between industrial clusters and OCS, as, this may be related to the development of OCS [69,70]. Therefore, despite its discrepancy with the other companies, we decided to study this company in order to analyze and draw empirical conclusions that corroborate with the literature about how company size affects the constructs this research analyzes. Small and medium-sized companies that generally comply with the same laws, negotiate with the same actors (e.g., suppliers and technology providers) and face the same environment [27] will soon seek agglomeration benefits to overcome difficulties [50].

Another important factor concerning to the development of OCS in the context of clusters was the institutional regulations. As presented, companies needed to issue environmental licenses and participate in programs aimed at promoting and preserving the health of employees and the context of clusters in which they were inserted, facilitated these actions. These findings are corroborated in the literature, which argues about the critical role of clusters in enabling companies to respond to regulatory processes [20,21]. In addition, Ko and Liu [70] highlight that companies develop capabilities to overcome institutional pressures.

We also highlight the pressure from buyers and suppliers as important factors related to the development of OCS in the context of the cluster. As presented, specialized suppliers offer lectures and produce more sustainable products to the cluster companies. Besides, company C highlighted that it eliminated the use of synthetic material in a shoe model according to the specifications of a specific customer. Company D also highlighted that

its main customers audit it so that it can meet the market's sustainability needs. These findings are corroborated by Lee and Klassen [71]. The authors stated that the monitoring of buyers influences the development of environmental management capabilities in the context of supply networks.

Propositions P3c and P3f require further empirical investigation, especially through case studies, to explain how and why such facts occur. Furthermore, some companies exhibit relationships between cluster characteristics and OCS, while others do not. This point is justifiable because although cluster characteristics are aimed at all companies in the cluster, not all of them necessarily use these characteristics for their benefit. For example, even though Company D was larger in size compared to other companies and despite the other companies' relative geographical proximity and support institutions' mediation, Company D showed no interest in maintaining collaborative relationships or exchanging knowledge with other companies in the cluster.

We also found that some companies showed the most robust development of specific OCS because they were more able to benefit from cluster characteristics. For example, Company B considered lectures organized by Sebrae on environmental and social awareness for employees important. Additionally, as a result of knowledge acquired in these lectures, the manager would implement actions in the company. These actions led to the development of capabilities related to alignment/motivation for sustainability (OCS4). Interviewee C, on the other hand, commented that the company currently does not show much interest in participating in these lectures and passing on the resulting environmental and social awareness to company employees.

Companies E and F, for example, are always in contact with some S System institutions to obtain support in developing process improvements. On the other hand, others did not demonstrate this involvement with institutions and lost the benefits of this support. Finally, only a few companies use proximity and interactions between companies to develop joint purchasing policies (Companies A, E, F and G) and input purchases and sales between some companies in the cluster (Companies E and F). In this sense, the present research indicates that companies aiming to develop more OCS can invest in promoting the specific benefits associated with the clusters in which they are inserted.

In this sense, the present research indicates that companies that wish to develop more OCS can invest in promoting the specific benefits associated with the clusters in which they operate. As highlighted by Yook, Choi and Suresh [69], all stakeholders need to understand the nature of capabilities and how they can help you to face challenges, and policymakers should encourage companies to get involved in sustainability.

Finally, the findings are in line with the previous literature, which considers that companies organized in networks tend to have benefits for the development of capabilities focused on sustainability [16–19]. Specifically, when focusing on cluster-type networks, this research extends the study by Hilliard and Jacobson [20]. They failed to state that companies located in clusters were more likely to develop capabilities to learn about environmental issues because maybe, the companies were not mature yet. Even in a specific context, we advance in this statement. Therefore, due to clusters characteristics, the companies studied learned to deal with recent challenges regarding how to develop organizational capabilities for sustainability in order to achieve some benefits.

## 7. Conclusions, Contributions, Limitations and Suggestions for Future Research

To answer how industrial clusters can foster developing organizational capabilities for sustainability (OCS), this paper develops a theoretical framework that relates clusters characteristics (CC) for OCS development, through the lens of benefits for companies that display these characteristics (Figure 1). To test the framework applicability, it was applied in seven companies in a footwear cluster to refine it and develop research propositions. The research findings contribute to both business theory and company management.



The theoretical framework is the main contribution of this research. On one hand, it shows the characteristics of companies operating in industrial clusters. On the other hand, it presents organizational capabilities that allow companies to improve their corporate sustainability. However, as previously explained, these constructs were not yet explicitly related in the literature. Therefore, to fill this research gap, both constructs were related to each other in an unprecedented way through identifying benefits arising from cluster characteristics that mediate this relationship.

Therefore, the theoretical framework attempts to expand and contribute to studies in the area of industrial clusters, organizational capabilities and sustainability by presenting five main characteristics of companies inserted in clusters, which are related to seven OCS, through the lens of nine different benefits for companies operating in industrial clusters. Altogether, 29 potential relationships between these constructs can be explored in depth by researchers in the field, resulting in several research insights.

Adopting the case study as a research method is relevant and necessary to explore this topic, since most studies applied a quantitative approach [1]. From the empirical findings, it was possible to conclude that the cluster is mostly composed of companies that do not have sustainable improvements as their main business strategies. Even so, actions linked to sustainable improvements are found and OCS development has proved to be a crucial factor for companies achieving these and other actions linked to sustainability.

The second contribution concerns the development of the research propositions addressing the relationships between cluster characteristics and OCS. Those relationships were evidenced in the empirical study and corroborated by the literature. The refined framework also represents an important research contribution (Figure 3), because among all the relationships represented in the theoretical framework, only those that were evidenced in the empirical study are presented. Additionally, it highlights relationships that were strongly based on empirical findings (relationships identified in all companies studied).

One of the managerial implications is that through the framework (theoretical and refined), managers have a tool to support strategic decision making, which makes it possible to identify which cluster characteristics are related to OCS development in order to improve corporate sustainability of companies. These actions also point to what can be improved in the relationships between the other organizations in the cluster in order to improve corporate sustainability benefits.

This research also presents limitations and opportunities for further research, such as the decision to concentrate the empirical study in only one cluster. Further research could analyze other clusters in different industries and compare their results with those from this research. The research method adopted also represents another limitation, since the relationships identified and presented in the refined framework are linked to the reality and specificities of the studied footwear cluster. In this way, future research could, through a quantitative approach such as a survey or multicriteria methods, test and validate all 29 relationships identified in the theoretical framework and/or the 16 relationships found and presented in the research propositions and in the refined framework.

Future research may also use other research methods to explore and/or validate these relationships. For example, one can explore these relationships through a panel of experts or use quantitative and multicriteria methodologies.

Future research is also encouraged to advance the relationships that were operationalized in this research in order to (1) deeper explore each OCS and the relationships among them (Are there synergies between OCS? How can they potentialize each other?), (2) better understand the relationship between cluster benefits and OCS (How can the identified benefits of companies in industrial clusters promote OCS development? Under what conditions or context variables can this relationship be reinforced?) and to (3) investigate the impact of OCS for organizations (How do OCS in organizations inserted in industrial clusters contribute to corporate sustainability performance and competitive advantage?).

Finally, cluster characteristics, assessed based on the benefits arising from the agglomeration studied, allow companies to develop (and/or improve) specific OCS and

consequently, their corporate sustainability. Therefore, these relationships, which have only recently been explored [25,26], are now more known more in depth as a result of this research.

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## Appendix A

**Table A1.** Footwear cluster characteristics.

CC	Grade	Description	Evidence
CC1	ST	All companies are relatively near one another due to the small city circumference where the cluster is located.	E1: Three main agglomerations of companies exist: the industrial hub where companies A, B, C, E and F are located; the industrial district (Company D); and city neighborhoods (Company G).
CC2	ST	Most of the companies studied interact and collaborate with each other.	E2: Companies A, B, C, E, F and G participate in periodic meetings organized by their union, their support institutions, lectures and fairs (attending together helps them reduce individual costs) and loan of inputs. E3: Companies A, B, C, E and F issued a joint environmental license. E4: Companies A, E, F and G previously had joint purchases and companies E and F buy and sell inputs with other companies in the cluster. These last two policies are still incipient.
CC3	ST	All seven companies converge on the importance of support institutions in the studied cluster. The S System is deemed greatly important, while the state government, Alberto Franco Leather and Footwear School and the city's university are all deemed important but to a lesser degree.	E5: The most prominent institutions are some organizations that make up the S system, which are Sebrae and Senai (National Service for Industrial Learning). These institutions organize fairs, lectures, events and trainings aimed at both businesspeople and employees. Additionally, Sesi (Social Service for Industry) aims to improve the work environment as well as health and safety at work. E6: The Albano Franco Leather and Footwear school is also considered a technology center. It develops labor that companies absorb and provides services to companies (model development, use of new processes and technologies, etc.). E7: We found that the city's university is not very representative because its support is punctual, which does not occur on an ongoing basis. Student design stemming from the design course (e.g., internships, material reuse and collection development) (Companies A, F, E and G) was evidenced. E8: Concerning the state government, interviewees indicated that although a program aims to develop the cluster, it could be more active, since the aid is timely. The main government contributions are subsidies for companies to attend footwear fairs and developing the footwear pole (where Companies A, B, C, E and F are located). The land was ceded to businessmen and the government financed factory shed construction. The project was intended to strengthen small businesses in the cluster.

Table A1. Cont.

CC	Grade	Description	Evidence
CC4	MO	No fierce competition exists between the companies studied. The most collaborative companies that compete with each other.	E9: Most companies studied have different footwear production focuses (Table 5) or different target markets. However, some companies in the cluster have the same production focus and are directed at the same target market, since the cluster has a relatively large number of companies. Even with shared target markets, companies consider this competition more positive than negative, since it encourages the improvement of products and processes. E10: Company G's main competitors are major footwear brands' franchises. Company A cites competition with informal footwear companies in Campina Grande, which becomes unfair competition, because informal companies have no charges, taxes and regulations because they simply copy formal companies' models and processes.
CC5	ST	Possesses a very strong historical and cultural identity in the city of Campina Grande.	E11: Since the city's inception in both history and culture, leather had already taken root as a raw material in footwear production. As a result, large footwear companies have settled in the city (Interviewee A). E12: The cluster located in a city that has acquired an identity in footwear production with prominence in the country benefits companies' marketing and assists in market performance (Interviewees F and G). E13: Footwear identity among the population also stands out; people possess knowledge of their backgrounds and parents and grandparents who were shoemakers share such knowledge with future generations.

ST: Strong characteristic MO: Moderate characteristic WE: Weak characteristic; CC1: Geographical proximity of companies; CC2: Local level interactions and collaboration; formal and informal associations and networks; CC3: Associations/interactions with support institutions (public and private companies); CC4: Competition stimulus; CC5: Identity/sociocultural factors.

Table A2. Organizational capabilities for the sustainability of companies A, B, C, D, E, F and G.

C	OCS	Grade	Description	Evidence
A	OCS1	MO	Acts jointly with others in the cluster that facilitate sustainability but in a limited way.	E1: Collaboration in a joint environmental license with other cluster companies. E2: Participation in a footwear union, attending a group of fairs and attending periodic meetings that address sustainability issues. E3: Joint participation in lectures and trainings developed mainly by System S support institutions during which sustainability is the primary agenda. E4a: Exchange of inputs with some companies in the cluster when necessary and E4b: Joint purchases, which improve logistical costs and reduce fuel consumption.
	OCS2	MO	Manages to acquire knowledge linked to sustainability through informal conversations with other companies in the cluster through lectures and seminars, which System S support institutions mainly develop.	E5: Periodic meetings that address sustainability issues. E6: Lectures and trainings developed mainly by System S support institutions during which sustainability is the primary agenda. E7: The company exchanges information with others, for example, information about suppliers who provide recycled material for purchase. E8: A specific supplier company demonstrates its environmental concern when it requires environmental licenses.
	OCS3	MO	Possesses no innovation actions whose main objective is sustainability but indirectly participates in certain technologies in the production process that allow for specific sustainable improvements.	E9: Production process in the injection molding machines allows complete material reuse. E10: Development of 100% cotton sneakers instead of using synthetic materials.

Table A2. Cont.

C	OCS	Grade	Description	Evidence
A	OCS4	WE	Environmental awareness passed on to workers through lectures and training developed through The S System. The company organizes internal actions that create sustainability but alignment for employees is not very evident.	E11: Lectures and training developed mainly by The S System's support institutions where environmental and social awareness topics are addressed. E12: Separate garbage bins are used for waste within the company, which even though simple, displays environmental and social responsibility.
	OCS5	NO	There are no capabilities linked to sustainability-oriented marketing	E13: The interviewee affirms that no advertising mentions the use of recycled material in shoes, since sharing this information would hinder customers' interest in the product and reduce sales.
	OCS6	MO	Can adapt in a limited way to environmental and social sustainability issues imposed by regulatory bodies. Has the flexibility to follow market trends, which can indirectly bring sustainable improvements.	E14: An environmental operating license was jointly issued by SUDEMA and IBAMA. E15: Compliance with employee health and safety measures is imposed by the Ministry of Labor as well as use of the PPRA and PCMSO programs. E16: Exchange of traditional glue for a substance that does not pollute water, which is water-based and reduces workers' health risks. Same evidence as E10 cited above.
	OCS7	MO	Does not have actions specifically aimed at managing sustainable operations but indirectly makes specific changes and improvements in the production process, allowing for timely sustainable improvements.	E17: Use of recycled material as a production input. E18: Correct waste disposal. Same evidence as E9 and E10 mentioned above.
	OCS1	MO	Same as Company A.	Same evidence as E1, E2, E3 and E4a (Company A).
	OCS2	MO	Same as Company A.	Same evidence as E5, E6 and E7 (Company A). E19: Lectures given by suppliers that present environmentally responsible products and E19b: Manager acquires knowledge through lectures and seminars and shares this knowledge with company employees.
	OCS3	WE	No present innovation actions that have a main objective of achieving sustainability; indirectly, only one specific action was found.	E20: Development of a sneaker made with reusable material at a specific customer's request.
B	OCS4	MO	Environmental awareness is shared with employees through lectures and training developed through the S system and also periodically company organized.	Same evidence as E11 (Company A). E21: Lectures on environmental and social awareness for employees, organized by the company manager, who was once a professor at Senai (the cluster support agency). E22: Donating a portion of one's trash for use in social work, such as recycling projects.
	OCS5	NO	Same as Company A.	E23: The interviewee states that no periodic actions, such as advertisements that involve environmental issues exist in the company.
	OCS6	MO	Can adapt to a limited extent to environmental and social sustainability issues imposed by regulatory bodies.	Same evidence as E14, E16 (Company A) and E20 (Company B).
	OCS7	WE	No actions specifically aimed at managing sustainable operations; indirectly, the evidence is very timely.	Same evidence as E18 (Company A). E24: The cutting process is still manual but executed in a manner that guarantees low waste.

Table A2. Cont.

C	OCS	Grade	Description	Evidence
C	OCS1	MO	Same as Company A.	Same evidence as E1, E2, E3 and E4a (Company A).
	OCS2	MO	Same as Company A.	Same evidence as E5, E6 and E7 (Company A).
	OCS3	MO	Same as Company A.	Same evidence as E9 (Company A) and E20 (Company B).
	OCS4	WE	Same as Company A.	Same evidence as E11 (Company A). E25: In the past, support institutions organized more lectures for company employees but currently the company has no interest in these actions, because management is concerned with pauses in production as a result of the lectures.
	OCS5	NO	Same as Company A.	Same evidence as E23. E26: The use of recycled material in the manufacture of sandals is passed on to customers but the information does not become an attractive differential.
	OCS6	MO	Same as Company A.	Same evidence as E14 and E15 (Company A). E27: Construction to solve a water accumulation problem, which the Ministry of Health requires.
	OCS7	MO	Same as Company A.	Same evidence as E9, E17 and E18 (Company A).
D	OCS1	ST	Displays a strong interaction with customers and suppliers to resolve sustainable issues. Collaboration with supporting institutions also stands out. However, no collaborative relationship exists between this company and the others in the cluster.	E28: Specific supplier development management area. E29: The company audits its suppliers and also undergoes customer audits, which assess aspects of social and environmental responsibility. E30: Support institutions are responsible for training and developing their labor force in environmental awareness.
	OCS2	ST	Acquisition of knowledge in sustainable issues occurs mainly for customers, suppliers and support institutions.	E31: Meetings with customers and suppliers occur where information on sustainability is exchanged. E32: Audits between customers and suppliers that involve sustainability issues occur. Same evidence as E6 (Company A).
	OCS3	ST	Innovation linked to sustainability is considered strong in the company; product development and production processes are strongly linked to environmental concerns.	E33: The company's brands launch collections related to sustainability. E34: Contracts with global auditing companies are in place, which certify the compliance of products and processes with environmental and social sustainability.
	OCS4	MO	Environmental awareness is shared with workers through lectures and trainings developed by the S System and several company actions.	Same evidence as E11 (Company A). E35: Lectures on environmental and social awareness for employees and other partners. E36: Contraction of labor and services that have environmental licenses, codes of ethics and practice social responsibility.
	OCS5	MO	Notable actions linked to sustainable marketing exist.	E37: The products (brands) have some bias linked to sustainability issues. E38: The company is audited by its main customers, so it is able to meet market needs for sustainability. E39: Advertising campaigns focused on sustainability are periodically carried out. Through the company's website, it was possible to observe such campaigns.

Table A2. Cont.

C	OCS	Grade	Description	Evidence
D	OCS6	ST	Can adapt to environmental and social sustainability issues imposed by regulatory bodies and customers.	E40: The company is audited by large customers that impose codes of conduct related to environmental and social sustainability. E41: Presents all certifications and operating licenses required by regulatory bodies.
	OCS7	ST	The company's operational processes are focused on issues of environmental and social responsibility.	Same evidence as E18 (Company A). E42: The products undergo laboratory analysis and do not contain substances harmful to the worker's health or the environment. E43: The company has sustainable solid waste management. They reuse water from the industrial process and capture solar energy for parking. E44: Waste transformation work. E45: Development of supply chain sustainability, with an emphasis on transforming industrial waste into new raw materials for the production process.
E	OCS1	MO	Same as Company A.	Same evidence as E1, E2, E3, E4a and E4b (Company A). E46: Purchase and sale of inputs with other cluster companies.
	OCS2	MO	Same as Company A.	Same evidence as E5, E6 and E7 (Company A). E47: Supplier fairs for suppliers that present environmentally responsible products, organized by Sebrae.
	OCS3	MO	Same as Company A.	Same evidence as E9.
	OCS4	MO	Environmental awareness is shared with workers through lectures and trainings developed through the S system and organized by the company; they claim to pass this awareness on to workers.	Same evidence as E11 (company A). E48: We try to pass environmental and social awareness to workers, regarding the waste, reuse and disposal of materials. E49: The company claims that its material is 99% recyclable and employees are aware of the importance of this.
	OCS5	NO	Same as Company A.	Same evidence as E23 (Company B). E50: Sebrae provides training and works within companies to take sustainable footwear to events alongside marketing, which presents Paraíba's shoes as sustainable footwear. However, no such internal capacity exists within the company.
	OCS6	MO	Same as Company B.	Same evidence as E14 and E16. E51: The company states that it is necessary, it seeks Sebrae's expertise to develop a program to cover each need, which is then presented to all cluster companies.
	OCS7	MO	Same as Company A.	Same evidence as E16 and E17. E52: Participation in training within the factory or in support institutions, developed with a focus on productivity, use of raw materials, labor and personnel training. E53: Using only synthetic material when producing shoes. E54: Brazil's most productive program to reuse stored, raw materials, which was implemented in the company this past year and this year. The company was used to pilot the program and it obtained good results.

Table A2. Cont.

C	OCS	Grade	Description	Evidence
F	OCS1	MO	Same as Company A.	Same evidence as E1, E2, E3 E4a and E4b (Company A). E55: Sale and loan of the waste produced in the company, which are given to other companies.
	OCS2	MO	Same as Company A.	Same evidence as E5, E6 and E7 (company A) and E19 (company B).
	OCS3	MO	Same as Company A.	Same evidence as E9.
	OCS4	MO	Environmental awareness passed on to workers through lectures and trainings developed by the S System. Internal, punctual actions, organized by the company.	Same evidence as E11 (Company A) and E22 (Company B). E56: As a motivational measure linked to environmental awareness, the company separates money collected from selling garbage, so that at each year's end, the company can buy food baskets as gifts for employees so that they can see the positive effects of encouraging sustainability.
	OCS5	NO	Same as Company A.	Same evidence as E23 (Company B).
	OCS6	MO	Same as Company B.	Same evidence as E14, E15 and E16.
	OCS7	MO	Same as Company A.	Same evidence as E9 and E18 (Company A). E57: Some processes have passed and are undergoing improvements, aiming to better use inputs and thus reduce waste, such as improving cutting knives to allow an almost zero flap and improving machines to reduce line pieces. E58: Decrease in the use of leather in shoe production.
G	OCS1	MO	Same as Company A.	Same evidence as E1, E2, E3 and E4a and E4b (Company A).
	OCS2	MO	Same as Company A.	Same evidence as E5, E6 and E7 (Company A) and E47 (Company E). E59: Seeks to know your suppliers and the way they work.
	OCS3	MO	Same as Company A.	E60: The product is constantly changing and improving its design because it is a differentiated line in the city. Then, leather was replaced by fabric, as the main input in the production of shoes, bags and accessories. E61: The company has already worked in association with a local cooperative to produce a line of colored cotton products.
	OCS4	WE	Same as Company A.	Same evidence as E11 (Company A) and E22 (Company B).
	OCS5	NO	Same as Company A.	Same evidence as E23 (Company B).
	OCS6	MO	Same as Company B.	Same evidence as E14, E15 and E16 (Company A).
	OCS7	WE	Same as Company B.	Same evidence as E18 (Company A) and E24 (Company B).

ST: Strong characteristic MO: Moderate characteristic WE: Weak characteristic; CC1: Geographical proximity of companies; CC2: Local level interactions and collaboration; formal and informal associations and networks; CC3: Associations/interactions with support institutions (public and private companies); CC4: Competition stimulus; CC5: Identity/sociocultural factors.

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