Fostering business model innovation for sustainability: a dynamic capabilities perspective

Diéssica Oliveira-Dias
Department of Business Organization, Marketing and Sociology, University of Jaén, EPS Linares, Linares, Spain and
Postgraduate Program in Business Administration, Federal University of Santa Maria, Santa Maria, Brazil, and
Jordana Marques Kneipp, Roberto Schoproni Bichueti and Clandia Maffini Gomes
Postgraduate Program in Business Administration, Federal University of Santa Maria, Santa Maria, Brazil

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Abstract

Purpose – The study aimed to analyze the association between dynamic capabilities and sustainable business model innovation of startups in the Brazilian logistics sector.
Design/methodology/approach – A qualitative approach was used through a multiple case study that was operated from semi-structured interviews and secondary data analysis.
Findings – The evidence found pointed to different types of innovations in sustainable business models and distinct activities inherent to the three dynamic capabilities surveyed. In addition, the results confirmed that dynamic capabilities can be considered internal drivers that stimulate sustainable business model innovation, since the conception until the change or dissemination.
Research limitations/implications – The diffusion of a model that jointly addresses the theory of dynamic capabilities and sustainable business model innovation.
Practical implications – For managers, the study provides insights into the archetypes of sustainable business model innovation and guidance on how to incorporate into the organization's strategic activities aimed at the different dynamic capabilities to achieve sustainable innovation.
Originality/value – Sustainable business model innovation is seen as a key factor for competitive advantage and corporate sustainability. However, a more comprehensive understanding is necessary for those that promote the design and innovation of sustainable business models. Therefore, the paper addresses this gap by (1) systematizing sustainable logistics initiatives, (2) detailing the processes that support the development of startups' sustainable dynamic capabilities and (3) proposing a framework that establishes connections between capabilities, business model innovation processes, business model archetypes and the environmental, social and economic impacts.

Keywords Sustainable business model innovation, Dynamic capabilities, Logistics, Startups, Sustainable innovation

Paper type Research paper

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1. Introduction

The growth of the world population and the patterns of production and consumption have led to the increased use of natural resources and consequent environmental impacts, making the search for new alternatives to build a sustainable future even more evident. This is especially true for the logistics sector, which is responsible for producing several negative effects such as atmospheric contamination, traffic congestion, high energy consumption among other negative impacts (Kauf, 2016; Lan and Zhong, 2018).

In this context, sustainable business model innovation is a key factor for a sustainable transition. However, a more comprehensive understanding of the value system and approaches to promote the design, innovation, dissemination and adoption of sustainable business models are still required (Evans *et al.*, 2017; Yang *et al.*, 2017). Foss and Saebi (2016, 2018) reported that there is a lack of theorization on the topic and highlighted that the literature on dynamic capabilities is an alternative to understand the internal drivers of business model innovation. Complementarily, different studies have argued that the dynamic capabilities approach is a promising form to provide a better understanding of strategic innovation management for sustainability (Dangelico *et al.*, 2017; Darmani *et al.*, 2017; Iles and Martin, 2013) and, more specifically, it can help identify which capabilities can be developed to more effectively overcome emerging sustainability challenges (Amui *et al.*, 2017; Bocken and Geradts, 2020).

Therefore, based on the assumption that there is a need for a greater understanding of the internal drivers for sustainable business model innovation and that the logistics sector plays a fundamental role in the global economy and ecological processes, this study aimed to filling this gap by analyzing how dynamic capabilities are associated with the sustainable business model innovation of companies in the Brazilian logistics sector. In this way, the present study intends to collaborate for the advancement of knowledge by associating these themes. Similarly, this study also provides valuable managerial contribution as it may help companies to increase the degree of sustainability of their activities through guidance on what dynamic capabilities are necessary for the incorporation and maintenance of sustainable strategies. In addition to promote the adoption of business behavior that integrates the objectives of sustainable innovation strategically, thus contributing to improving sectoral practices and increasing competitiveness. Besides, in emerging countries such as Brazil, due to its large territorial extension, and in many cases, precarious road infrastructure, logistics is a great challenge (Arvis *et al.*, 2018). Therefore, innovation becomes really important, and such developments can serve as an example for other emerging economies (Gunasekaran *et al.*, 2014).

Examples of new business models in the logistics sector can be seen by analyzing startups. These companies have been receiving a record amount of financing and, with technology-based solutions they are introducing innovations in logistics, ranging from last-mile delivery to the management of warehouses and stocks (CBInsights, 2016). In general, more and more small and medium-sized companies have gained relevance for sustainable development, mainly in the promotion of innovative solutions and better working conditions (Bocken *et al.*, 2014; Hockerts and Wüstenhagen, 2010; Klewitz and Hansen, 2014). At the same time, due to the high rates of startups failures (Teberga *et al.*, 2018), it is important to know how to build solid routines and develop dynamic capabilities to create a competitive advantage. Previous research has been conducted to shed light on the features of new logistics business models such as the value proposition supported by using new technologies and adopting new revenue models (Mikl *et al.*, 2021; Strandhagen *et al.*, 2017). Furthermore, the logistics industry is characterized by high uncertainty and, therefore, for startups to compete in this highly dynamic environment, they must develop dynamic capabilities. In this sense, previous studies have shown that the ability to identify customer needs is essential for the startups' growth (Teixeira *et al.*, 2021). Previous research has also revealed that companies must align customer needs with the requirements of sustainable development, taking a proactive role in creating sustainable behavior (Inigo *et al.*, 2017). Nevertheless, while

some attention has been devoted to studying the sustainable dynamic capabilities of traditional companies (Bocken and Geradts, 2020; Dangelico *et al.*, 2017; Mousavi *et al.*, 2018a), to date, there has been a lack of understanding concerning how startups can pursue sustainability building dynamic capabilities. Nonetheless, this study provides an original contribution to how logistics startups' dynamic capabilities are deployed and related to sustainable business model innovation, thus providing some practical guidance for logistics managers and researchers; this is done through multiple case studies of Brazilian startups. The contribution of this paper is unique from existing relevant studies for three main reasons: (1) it systematizes sustainable logistics initiatives by using a relevant framework, (2) the processes that support the development of startups' sustainable dynamic capabilities are detailed, and (3) the final framework proposed herein establishes clear and distinct connections between capabilities, business model innovation processes, business model archetypes and the environmental, social and economic impacts.

To present the results of this study, the present work is structured as follows: Section 2 provides a theoretical basis through a literature review. The study method is described in Section 3, followed by the results in Section 4 and discussion in Section 5. The conclusions are presented in Section 6.

2. Background

2.1 Dynamic capabilities

Research on dynamic capabilities focuses on dynamism in the competitive environment (Teece *et al.*, 1997; Teece and Pisano, 1994) and was first presented by Teece *et al.* (1997) as an extension of the resource-based view (RBV) (Barney, 1991). Teece (2012, p. 1395) defines dynamic capabilities as "the company's ability to integrate, build, and reconfigure internal and external resources/competencies to deal with and possibly adapt to rapidly changing business environments."

Teece *et al.* (1997) and Teece (2007) identified three types of dynamic capabilities: sensing, seizing and transforming. The dynamic capability of sensing involves the identification and evaluation of opportunities, that is, it is associated with the ability to perceive, filter, format and calibrate opportunities in the business environment (Teece, 2007). Sensing can be considered similar to the notion of learning focused on the market, which is related to the processes that enable the company to anticipate market developments and customer requirements, needs and preferences (Weerawardena and O'Cass, 2004). Seizing refers to mobilizing internal and external resources to capture the value of the opportunities identified (Teece, 2007). Transforming refers to the organization's capacity for continuous renewal and should allow the company to remain flexible in order that it can proactively prepare for the future even with the standards created and protection of assets made over time (Teece, 2014).

Together, the dynamic capabilities represent the characteristics and processes necessary to achieve a good position in a favorable ecosystem and aim to explain new strategic considerations and the decision-making disciplines necessary to ensure that opportunities can be seized and that business can be transformed (Teece, 2007). Therefore, applying the dynamic capabilities view in the context of startups is especially relevant since startups face a context of rapid transformation, where adapting and changing are key to surviving and creating advantages (Zahra, 2021). In this context, dynamic capabilities are defined by the ability of startups to anticipate and identify new business opportunities and develop new ideas and competencies to enhance their business performance (Girod and Whittington, 2017).

2.2 Sustainable business model innovation

For Boons and Lüdeke-Freund (2013), the business model concept captures the factors necessary for a company to be successful by combining the following elements: value

proposition (intrinsic value of the product/service offered by the company), supply chain (relationship with the company's suppliers), customer relationship; financial model (costs and benefits obtained from the above elements and their distribution among business stakeholders). In this sense, Schaltegger *et al.* (2016) reported that a sustainable business model helps describe, analyze, manage and communicate a company's sustainable value proposition to its customers and stakeholders, as well as how it creates and offers that value and ultimately how it captures economic value, maintaining or regenerating natural, social and economic capital beyond organizational boundaries. For Geissdoerfer *et al.* (2018), one of the forms of sustainable business model innovation occurs when a new organization with a new sustainable business model is created.

Bocken *et al.* (2014) and Ritala *et al.* (2018) aimed to describe mechanisms and innovations that can contribute to sustainability and identified nine sustainable business model archetypes. The archetypes identified were: (1) Maximize energy and material efficiency, (2) close resource loops, (3) substitute with renewables and natural processes, (4) deliver functionality rather than ownership, (5) adopt a stewardship role, (6) encourage sufficiency, (7) repurpose for society/environment, (8) create inclusive value and (9) develop sustainable scale-up solutions. Table 1 shows the archetypes proposed by the authors.

The proposed archetypes were used, for example, to analyze business models in large global corporations (Ritala *et al.*, 2018), in the banking industry (Yip and Bocken, 2018), and will be used as a basis to identify the different types of sustainable business model innovation in the present study.

2.3 Startups and logistics business models

Startups are companies that seek to develop and implement a repeatable, scalable and profitable business model to exploit market opportunities (Ehrenhard *et al.*, 2017). Some of the main characteristics of these organizations include dealing with high risks and failure rates (Teberga *et al.*, 2018). More specifically, an ecological or sustainable startup takes advantage of environmentally relevant market failures that represent interesting opportunities to achieve profitability and, at the same time, create sustainable value (Dean and

Innovation	Archetype	Definition
Environmental	Maximize material and energy efficiency	Do more with fewer resources, generating less waste, emissions and pollution
	Close resource loops	Reuse materials and products, turn waste into raw materials for other products/processes
	Substitute with renewables and natural processes	Use of non-finite materials and energy sources
Social	Deliver functionality rather than ownership	Provide services that meet users' needs without having to own physical products
	Adopt a stewardship role	Proactive engagement with stakeholders to ensure long-term health and well-being
	Encourage sufficiency	Solutions that actively seek to reduce end-user consumption
Economical	Repurpose for society/ environment	Seek to create positive value for all stakeholders, especially society and the environment
	Create inclusive value	Share resources, knowledge, property and wealth creation, including value creation
	Develop sustainable scale-up solutions	Provide large-scale sustainable solutions to maximize benefits for society and the environment

Source(s): Elaborated from Bocken *et al.* (2014) and Ritala *et al.* (2018)

Table 1.
Archetypes of sustainable business models

McMullen, 2007; Kuckertz *et al.*, 2019). Hockerts and Wüstenhagen (2010) call these small companies "Davids," which tend to be recently founded, have a relatively small market share and are more likely to try innovative approaches. These companies have a role to play in transforming industries for sustainable development and driving traditional companies to adopt their own sustainable initiatives, which are attracted by the initial success of startups (Hockerts and Wüstenhagen, 2010; Rask and Günzel-Jensen, 2019).

In this sense, the increase of environmental awareness, the need for sustainable business models, and the advancement of the collaborative economy are examples of changes that affect the economy in a general way and that also affect the logistics and new business models that are arising in the sector (Cassetta *et al.*, 2017; Strandhagen *et al.*, 2017). However, there is no consensus on the characteristics of a logistics business model (Mikl *et al.*, 2021). Nevertheless, some attempts have been made to provide an understanding of the features and elements of a logistics business model. For instance, Mikl *et al.* (2021) analyzed four business model characteristics: value proposition, value creation, value delivery and value capture and found differences between the business models of digital startups and traditional companies in the logistics industry. Strandhagen *et al.* (2017) illustrated how the digitalization of logistics and sustainability are driving the emergence of new business models and have focused on the four elements of a business model (value proposition, supply chain, customer interface and financial model) suggested by Boons and Lüdeke-Freund (2013). Moreover, Sun *et al.* (2021)sought to explain how a specific supply chain can innovate its business model to meet changing customer demands and studied six elements of the supply chain business model: process, end customer, partner, employee, product and environment.

2.4 Dynamic capabilities and sustainable business model innovation

Despite the potential of integrating dynamic capabilities and sustainable business model innovation, few studies have looked into this dimension to date. Table 2 presents a brief review of the recent literature on related topics.

In this sense, Bocken and Geradts (2020) addressed barriers and drivers that influence dynamic capabilities for sustainable business model innovation of large corporations. Collaborative innovation and long-term temporal orientation are examples of the main strategic drivers, while an excessive focus on exploiting existing capabilities is seen as an important barrier (Bocken and Geradts, 2020). Inigo *et al.* (2017) reported differences between evolutionary and radical business model innovation for sustainability. The study revealed that the literature has well covered evolutionary practices, although the literature on the logic behind radical business model innovation is less developed (Inigo *et al.*, 2017). Moreover, some studies focused on how dynamic capabilities can enhance sustainable innovation (Dangelico *et al.*, 2017; Mousavi *et al.*, 2018a, b), although without focusing on the business model innovation level. These studies constitute a starting point for the present work; the findings point to the importance of having sustainability as a strategic guide and establishing strategic partnerships to achieve sustainable results. However, these works have been developed in large companies from developed countries with a recognized trajectory in the context of the green economy. Another approach is presented by Sun *et al.* (2021), who focused on the supply chain level; the authors demonstrated that using customers and potential customers to identify business opportunities and align supply chain members are drivers to achieving sustainable goals. Furthermore, none of these papers provided specific insights into how startups' dynamic capabilities are deployed and related to sustainable business model innovation. It is also important to note that the literature on business model innovation and sustainable innovation is dispersed and heterogeneous (Pieroni *et al.*, 2019). Therefore, this study considers the aforementioned archetypes of business model innovation

Table 2.
Recent related literature

Author and year	Research objective	Methodology	Context	Main findings
Sun *et al.* (2021)	Explore how focal tea companies facilitate supply chain business model innovation to meet consumer demands and achieve sustainable development	Case study	Chinese tea supply chain	There is a relationship between end-user innovation-driven, dynamic capabilities and supply chain business model innovation
Mikl *et al.* (2021)	Define and understand the differences between the business models of digital startups and traditional companies in the in the freight forwarding industry	Multiple case study	Digital startups and traditional companies in the freight forwarding industry from German-speaking countries	Differences between the business models of startups and traditional companies' business model components analyzed in the study (value proposition, value creation, value delivery and value capture). Startups offer services that are new to the logistics industry
Bocken and Geradts (2020)	Investigate barriers and drivers at the organization design and how they affects dynamic capabilities needed for sustainable business model innovation	Grounded theory approach	Large multinational corporations	A list of barriers and drivers at the organizational design level that contribute to dynamic capabilities for sustainable business model innovation is presented
Feng *et al.* (2019)	Analyze the evolutionary mechanism of an innovation ecosystem by adopting a dynamic capabilities approach	Case study	Chinese automobile company	Insights into how a company acquires and integrates resources to be the ecosystem leader
Mousavi *et al.* (2018a)	Explore how dynamic capabilities and organizational routines have an effect on innovation toward a greater degree of sustainability	Survey	Germany companies	Dynamic capabilities have a significant direct effect on innovation toward sustainability
Mousavi *et al.* (2018b)	Identify microfoundations of science-based firms' dynamic capabilities for high-tech environmentally sustainable innovation.	Case study	Large science-based manufacturing companies from USA and Netherlands	Dynamic capabilities to identify and shape the high-tech innovation opportunities for sustainability are grounded on several microfoundations, which are presented in the study
Dangelico *et al.* (2017)	Develop a theoretical framework from a sustainability-oriented dynamic capability perspective	Survey	Italian manufacturing firms	External resource integration is a sustainability-oriented dynamic capability that affects the green innovation capability
Inigo *et al.* (2017)	Examine the organizational processes of business model innovation for sustainability from the dynamic capabilities perspective	Multiple case study	Spanish Basque companies from eight industries	Found differences between evolutionary and radical business model innovation for sustainability, including the distinctions among dynamic capabilities
Strandhagen *et al.* (2017)	Provide an overview on links between sustainability, business models, Industry 4.0 and Logistics 4.0.	Literature study and conceptual research	Industry 4.0 and Logistics 4.0	Describe trends in logistics and how they affect business models and sustainability

and the dynamic capabilities of sensing, seizing, and transforming, thus combining two consolidated frameworks to provide a comprehensive and original contribution for academics and practitioners.

2.4.1 Initial theoretical framework. According to previous literature (Leih *et al.*, 2015), each of the three groups of dynamic capabilities is related to innovation, development, and the implementation of a business model.

Thus, sensing includes the identification of unmet needs, which is a fundamental step to develop a business model. In this sense, the capability of sensing to advance on issues of environmental innovation involves exploring new technological opportunities with a "green lens" (Castiaux, 2012). Souto and Rodriguez (2015) also highlighted the importance of cooperation in innovation activities in obtaining environmental innovations and highlight the need for cooperation between public research centers and companies. They also show that the main barriers encountered by companies when innovating toward sustainability are the lack of qualified personnel, limited information on environmental technologies, lack of information on markets, difficulty in finding partners for innovation and uncertain demand for innovative goods and services. Furthermore, Sun *et al.* (2021) pointed out that environmental awareness is an important capability to meet the demand for sustainable products.

In this way, sensing helps companies to obtain information about environmental and social challenges and provides solutions for sustainable innovation (Mousavi *et al.*, 2018b). Thus, the previous arguments lead to the following proposition:

P1. Sensing dynamic capabilities are associated with sustainable business model innovation.

The ability to take advantage of opportunities is related to the use of resources to create and capture value from identified discoveries, inventions or innovations. The capabilities of this group also include those aimed at the ability to develop relationships throughout the supply chain, whether through relationships with suppliers, customers or other stakeholders (Sun *et al.*, 2021). Dangelico (2016) highlighted that many factors can influence the successful development of green product innovation, such as the commitment of upper management, the creation of collaborative networks, the improvement of knowledge flows inside and outside of the company and cross-functional integration. Fernandes *et al.* (2017) found a direct relationship between the number of formal agreements reached with research centers and new product launches by incubated companies. In this case, companies need to cooperate with several external partners to a greater extent than conventional innovation in order to seize opportunities for sustainability (De Marchi, 2012; Marzucchi and Montresor, 2017). Similarly, Bocken and Geradts (2020) found that collaborative innovation is a relevant strategic driver for sustainable business model innovation. The partnership should not focus on covering a specific lack of skills or knowledge of the company, but rather provide an opportunity for mutual learning, co-creation, and shared responsibility among partners (Inigo *et al.*, 2017). Thus, the following proposition can be outlined:

P2. Seizing dynamic capabilities are associated with sustainable business model innovation.

The ability to transform is fundamental when new threats and opportunities present themselves, in addition, it is also necessary to loosen the rigidity that develops in the organization over time (Leih *et al.*, 2015). Transformation and resource management are indicators of the company's ability to adjust to its environment to develop more effective competencies that give them a competitive advantage in rapidly changing environments (Teece, 2007). Evidence from different companies has shown that successful innovation is not

only the result of technological advances, success will also depend profoundly on how companies can renovate organizational resources and skills in response to various demands in changing environments (Adner and Helfat, 2003; Si *et al.*, 2021). As innovation for sustainability generally needs to go beyond incremental adjustments, it requires radical changes that can promote a break in standards for the supply chain (Boons *et al.*, 2013). Finally, it is highlighted that spreading the sustainability mentality throughout the organization and establishing the division of responsibilities for collective decision making makes the organization more resilient (Inigo *et al.*, 2017). Therefore, the following proposition is established:

P3. Transforming dynamic capabilities are associated with sustainable business model innovation.

Based on the literature review and the study's proposals, a model designed to analyze the dynamic capabilities of sensing, seizing and transforming and sustainable business models is presented.

The model developed includes studies by several authors and covers different perspectives of analysis. The joint approach of these themes provides an understanding of the studied topic through the articulation of different concepts (Figure 1).

3. Methodology

To achieve the proposed objectives, the multiple case method will be used. Thus, the result is dependent on multiple sources of evidence that converge and whose results benefit from theoretical propositions before data collection and analysis (Yin, 2007). In this context, the multi-case study proves to be an adequate strategy, as the main objective of the work is not to quantify, but rather describe and qualify the phenomena of dynamic capabilities and sustainability of the companies studied.

The search for companies was carried out on specific websites and rankings about startups such as the database offered by the Brazilian Association of Startups and the AngelList platform. After the selection of an initial list of startups, consultations were also carried out in the database of companies certified by System B (B Corporation), and on the companies' websites to check whether the value proposition of these startups was clearly linked to

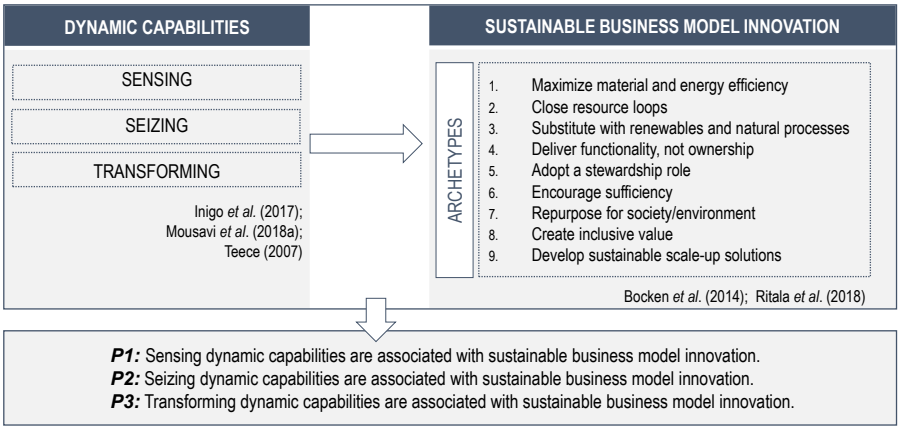


Figure 1.
Conceptual framework

Source(s): Prepared by the authors

environmental and or social values. In this sense and corroborating Patton (1990), this study follows the criterion sampling technique by picking all cases that meet some criterion.

As a result of this initial scrutiny, five startups were considered as potential cases, based on their value propositions that clearly covered environmental and or social aspects. Finally, three Brazilian logistics startups with different types of business models agreed to participate in the research and were selected as analysis cases for the present study. The importance and relevance of choosing these three startups was supported by their innovative business models and sustainable actions, which were recognized by several awards and reports by the press. Moreover, two of them have been a certified B Corporation (B Corporation, 2018). The cases share certain similarities (startup characteristics, logistics sector and environmental and social goals), albeit they are also mutually different in size and specific logistics activities, which makes it possible to obtain a significant amount of information regarding the topic being studied. Startups analyzed were named KBRloop, LBRcargo and OBRcollab in order to guarantee anonymity. The main characteristics of the selected startups are summarized in Table 3.

The data collection process was carried out through semi-structured interviews applied to those responsible for the selected startups and through documentary research (Hair *et al.*, 2005; Yin, 2007). The protocol used for the interview, which has 24 questions, was elaborated from the literature review and the proposed conceptual model (see Appendix). To verify the clarity and relevance of the questions, the instrument was previously evaluated by three experts in the field of sustainability. Because it is a semi-structured interview, new questions could arise or others could skip depending on the progress of the interview.

The interviews were conducted from December 2018 to June 2019 using technological resources, such as Skype. The interviews were recorded with the permission of the respondents and later transcribed to better understand their content. The average interview lasted 40 min. Table 4 provides details regarding the profile of the interviewees.

In addition to the interviews, several sources were consulted such as published reports, websites, newspapers, advertisements and videos on social networks among other media. A summary of the secondary sources used in the data collection stage is presented in Table 5.

The data were analyzed by content analysis, which is the unveiling of meanings of different types of discourses based on inference or deduction (Bardin, 2011). According to

Interviewee	Position	Interviewee's years of experience in the sector
Interviewee KBRloop	Project Manager	3
Interviewee LBRcargo	Co-founder	7
Interviewee OBRcollab	Co-founder	2

Source(s): Prepared by the authors based on the data obtained

Table 3.
Interviewees' profiles

Characteristics	KBRloop	LBRcargo	OBRcollab
Year founded	2011	2012	2018
Number of employees	150	30	0[a]
Size	Medium-sized Company	Small company	Micro-enterprise
Logistics activity	Reverse Logistics	Last-mile deliveries	Collaborative deliveries

Note(s): [a]The company was formed by four founding partners, however it had no employees at the time of the survey

Source(s): Prepared by the authors based on the data obtained

Table 4.
Description of the companies analyzed

Table 5.
Summary of data sources

Sources of data	KBRloop	Startup LBRcargo	OBRcollab
Official website of the startup	1	1	1
Company blog	1	1	1
System B report	1	1	–
YouTube videos	10	2	1
News in the media	6	5	1
Instagram posts	7	5	6
Other reports	1	–	–
LinkedIn profile	1	1	1
Company mobile application	–	–	1

Source(s): Prepared by the authors

Bardin (2011), content analysis is organized into three phases: (1) pre-analysis, (2) exploring the material and (3) treating the results, inference and interpretation. Pre-analysis is the phase in which the material to be analyzed is organized in order to make it operational, systematizing the initial ideas. In the second phase, an analytical description of the collected material is made, guided by the hypotheses and theoretical references; coding, classification and categorization are performed in this phase (Bardin, 2011). Additionally, Bardin (2011) stated that the categories could be created *a priori* or *a posteriori* (i.e. from the theory alone or after data collection). The third stage is intended for treating the results; it occurs by condensing and highlighting the information for analysis, culminating in inferential interpretations (Bardin, 2011). More specifically, in the coding process, we followed a deductive process based on categories created from the reviewed literature (prior categorization) (Bardin, 2011). To help the data analysis process, the NVivo software was used, which facilitated the categorization by creating nodes and triangulating the data obtained through transcription of the interviews and videos and visualization of the other documents used as secondary data sources. The analysis of secondary sources, such as blog texts, videos (with interviews with managers), news and social media content, has proven to be of the utmost relevance to obtain an insight into the whole trajectory of the companies studied, given that this type of material has been published over the years. To perform the content analysis, we first analyzed each case individually using the theoretical framework for the interpretation, and subsequently, a cross-case analysis was performed (Yin, 2007).

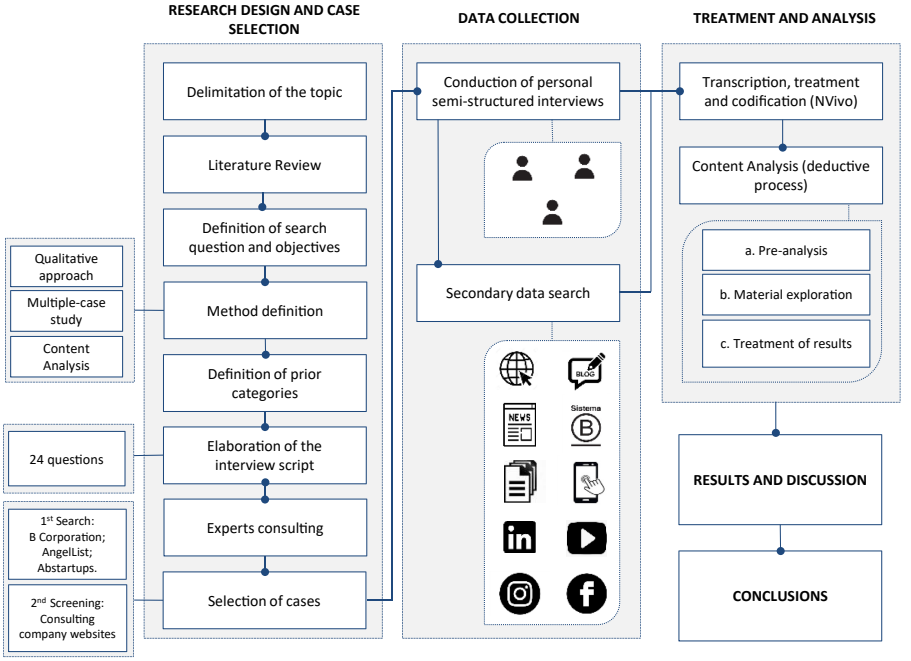
A summary of the research design and steps taken are shown in Figure 2.

4. Results

4.1 Case 1: KBRloop

The KBRloop startup works with inserting organizations into the circular economy. The company seeks to understand the main challenges for this insertion and works with issues of reverse logistics, development of recycling technologies, and subsequently the development of products made from these recycled raw materials.

4.1.1 Dynamic capabilities. For sensing, KBRloop has a wide portfolio of sensing activities from internal sources. The startup has, for example, a marketing team that focuses on market research to identify trends. Moreover, it has several procedures for measuring the environmental and social impacts generated. On the other hand, the KBRloop interviewee pointed out that many of its customers have been with the company since the beginning, thus, they are important sources for identifying trends and positioning. Another point worth mentioning is the monitoring of digital media for clients and future clients to identify



Source(s): Prepared by the authors

Figure 2.
Summary of the research steps

opportunities, in addition to different external sources to complement the knowledge obtained from other sources. The interviewee cited recycling and sustainability portals, such as Ellen Macarthur, in addition to packaging and sustainability magazines and publications by the Brazilian Ministry of the Environment, which help to guide projects to meet the Brazilian National Solid Waste Policy.

Regarding seizing, KBRloop develops solutions internally or in partnership with other companies in a proactive way for the market. In addition to technological developments with a sustainable value proposition, KBRloop launched a course on circular economics in 2019. The startup also developed its own methodology to structure and facilitates the process of inserting companies into the circular economy. Furthermore, the company seeks ways to integrate materials that would normally be discarded in its production processes. It was also possible to observe that the company shares resources and competences with different stakeholders to take advantage of opportunities related to sustainability challenges. According to the interviewee, cooperation takes place at different stages and processes of the company's value chain. To carry out research and development activities, the company has, for example, a laboratory installed inside a university. In addition, the company maintains partnerships with other universities and encourages that ideas born within the academic environment can be translated into the market.

In terms of the dynamic capability of transforming, the startup began to restructure its work organization structure in 2018. The company transitioned from a traditional structure divided into departments into a network structure. According to the interviewee, the new method increases the interaction among people in the company and allows employees to experience new roles in different networks, which leads to more decentralized knowledge management. Regarding the management of external relations, the company adopts an open innovation process by collaborating with other companies in the sector, universities,

technology institutes and recycling companies. Thus, one of the last partnerships signed by the company is a partnership with a multinational in the chemical sector to produce plastic resins from disposable materials.

4.1.2 Business model innovation. The business model innovation strategy of KBRloop focuses on creating value by inserting companies into the circular economy. Seven sustainable business model archetypes were identified:

(1) Maximizing energy and material efficiency by adopting practices aimed at the conscious consumption of water and electricity and eliminating the need for transportation to treat effluents and the optimization of the transportation of other waste or materials.

(2) Closing resource loops by inserting companies into the circular economy and applying these principles in the company's own production process.

(3) Adopting a stewardship role by employing practices that aim to guarantee the well-being of its employees and other stakeholders by improving the working conditions of employees of the allied material-recycling companies.

(4) Encouraging sufficiency with specific actions aimed at raising the awareness of customers and society in general about the importance of reducing the use of plastic, its consumption, and discarding with awareness. The company conducts lectures, courses, participates in debates and also uses its social networks to inform the public about the need for sustainable consumption.

(5) Repurposing for society/environment through strong interaction with its stakeholders and executing projects that generate, in addition to economic value, environmental and social benefits, such as developing technology to perform sterilization and taking advantage of the materials used in disposable diapers.

(6) Creating inclusive value by performing several activities to share knowledge with a wide group of stakeholders, such as "chats," lectures and specific courses.

(7) Developing sustainable scale-up solutions through collaboration with different stakeholders, including installing collection points, partnerships with cooperatives, using idle productive spaces of partner companies and developing a structured work methodology. Table 6 presents some of the evidence supporting the information about KBRloop.

Table 6.
Evidence from the KBRloop case (translated from Portuguese)

No.	Evidence	Source
1	"So for each customer, we know how many kilos or tons of garbage we are recycling in a project. And also with our cooperative projects, we're able to measure our social impact, in terms of income, improved quality of life, the materials that stop going to landfills and are recycled (. . .)"	The interview
2	"Today we are partnered with more than 200 cooperatives to work with reverse logistics (. . .)"	The interview
3	"Innovation does not happen alone. We are the catalyst in a collaborative, open innovation process that takes the best of each link in the chain and puts it out there"	News, 2019
4	"We give lectures on the problems of waste, raise awareness on, for example, single-use plastics (. . .)"	The interview
5	"The development of a unique methodology was one of the points that improved scaled growth"	News, 2019

Source(s): Research data

4.2 Case 2: LBRcargo

LBRcargo offers a sustainable solution for urban logistics when delivering e-commerce orders using cargo bikes.

4.2.1 Dynamic capabilities. Concerning the dynamic capability of sensing, LBRcargo does not have a specific department or area to address the challenges related to sustainability. In this sense, the interviewee highlighted that sustainability is rooted in the company's day-to-day activities and is the central part of the business, directing its actions. According to Mousavi *et al.* (2018a), having sustainability as the guiding principle of the organization's innovation strategy improves strategic decision making and consequently allows the selection of which opportunities will be seized by the company. On the other hand, the company has a base study that allows quantifying how much the company stops emitting polluting gases when using bicycles and not motorcycles or other polluting vehicles. For LBRcargo, the partnership with large e-commerce companies allows it to know some of the market trends and participate in events organized by an institute dedicated to accelerating business with social impact. System B allows them to exchange experiences with other organizations.

As for the dynamic capability of seizing, it was possible to verify that LBRcargo changed its operating market over time. The changes were necessary for the company to adapt to market demands. This is in line with what was exposed by Teece (2010), who commented that the correct business model hardly appears since the beginning in emerging segments. Moreover, the interviewee highlighted that the company's service is focused on ecological deliveries, thus there are other forms, in addition to the bicycle, that may be adopted in the future. Another process adopted by the startup that contributes to reducing negative impacts on the environment is the incorporation of technology for digitizing orders, which replaces processes that traditionally require the use of paper. However, two examples of cooperation that contribute to the generation of sustainable value can be highlighted. The first case is a partnership with a company that develops solutions that make it possible to transform a wheelchair into an electric motorized tricycle that enabled the company to hire a wheelchair user as a delivery man. In the second case, the company provides a reverse logistics service, and for it to work, the collaboration of the consumers is necessary, as they can, for example, leave the used capsules in their condominium's concierge.

Regarding the dynamic capability of transforming, LBRcargo is structured in three areas and each partner of the company is responsible for one of these areas. One of the relationship management methods identified concerns the relationship with self-employed cyclists, which allows the company to have a flexible base of service providers. On the other hand, in the interviewee's opinion, the decentralization of knowledge is a method that needs to be adopted by the company.

4.2.2 Business model innovation. The innovation strategy of the startup LBRcargo is focused on offering sustainable solutions for urban logistics. Eight sustainable business model archetypes were partially or fully identified:

(1) Maximizing energy and material efficiency by reducing CO_2 emissions, given that the use of bicycles to deliver orders is an alternative to conventional means of transport that emit polluting gases.

(2) Closing resource loops by acting as a link in the reverse logistics chain to close the resource cycle (incipient application).

(3) Replacing with renewable and natural processes, with the possible adoption of other types of sustainable methods, including purchasing electric vehicles.

(4) Adopting a stewardship role, inclusive actions by hiring minorities, such as wheelchair users and ex-inmates, in addition to the concern for the well-being of its employees.

(5) Encouraging sufficiency with specific actions by publishing content on social networks about the importance of adopting more sustainable lifestyles (incipient application).

(6) Repurposing for society/environment by reducing pollution caused by urban deliveries and adopting better policies and practices with employees.

(7) Creating inclusive value by offering sustainable viable solutions to its customers (incipient application).

(8) Developing sustainable scale-up solutions through the base of registered autonomous service providers that allows the startup to increase its delivery capacity and with the creation of micro-hubs (transfer points where goods are transferred from one vehicle to another). Table 7 presents some of the evidence that supports the information about LBRcargo.

4.3 Case 3: OBRcollab

Using an application, the startup OBRcollab offers an online platform to connect people who wish to send a package or request a ride with someone willing to drive or share the trip.

4.3.1 Dynamic capabilities. Regarding the dynamic capability of sensing and considering the specific characteristics of the startup, the multidisciplinarity of the partners is the main internal source of knowledge of the company. The main source of market information identified was its customers. In this sense, the use of surveys was established as a culture within the company. On the other hand, a Brazilian institution to support microenterprises and small companies and another startup in the same city were some of the external sources of information pointed out by the studied startup. However, the interviewee commented that there is still no culture and infrastructure to support startups in its region.

As for seizing, to confirm the innovation opportunity that gave rise to the opening of the startup, market research was performed. The adoption of principles of sharing economy for the design of their business model is another important point to guide the seizing of opportunities.

With respect to transforming, it is worth noting that OBRcollab does not have a formal organizational structure and the division of labor between the partners is carried out according to the knowledge of each one. The information is shared in meetings between the company's partners and according to the interviewee the company had not yet established formal relations with other stakeholders. In this sense, Mousavi and Bossink (2017, p. 1272)

No.	Evidence	Source
1	"From the point of view of sustainability and the like, we are very close with the Quintessa Institute and System B, which are two entities that give a good push in this sense of exchanging experiences, exchanging know-how"	The interview
2	"In fact, we talk about ecological deliveries, but if a model ever appears, for example, the drone finally becomes viable (. . .) we do not rule out any model, although our priority will remain the bike"	The interview
3	"While delivering new orders, (. . .) employees collect used capsules from customers"	News, 2018
4	"I think the best well-being I can offer is providing a fair remuneration, with few hours of work, where the employee is not exploited and does not need to give up his personal life to get some kind of remuneration"	The interview

Source(s): Research data

Table 7. Evidence from the LBRcargo case (translated from Portuguese)

emphasize that organizations must "work with new types of partners to motivate and inspire systemic changes," given that companies alone have a limited impact on sustainability challenges.

4.3.2 Business model innovation. The innovation strategy of this case is based on the collaborative or sharing economy. Four sustainable business model archetypes were partially or fully identified:

(1) Maximizing energy and material efficiency by encouraging the use of existing cargo capacities in deliveries that would otherwise be done anyway.

(2) Repurposing for society/environment and proactively seeking to generate value for its market. The company's goal is to provide alternatives for people or small businesses that are far from large urban centers.

(3) Creating inclusive value by enabling the sharing of resources between peers.

(4) Developing sustainable scale-up solutions by offering a purely digital service. Table 8 presents some of the evidence that supports the information about OBRcollab.

5. Discussion

This section discusses the results of the multiple cases in light of the literature. Regarding sensing, in general, each startup uses different mechanisms to detect opportunities. On the other hand, the difference in the business context of OBRcollab stands out, as it has a smaller support network compared to the other two companies. As for seizing, it was possible to note that once an opportunity for innovation is recognized, the companies studied use different business activities to take advantage of them, such as allocating internal resources for market research or research and development activities and cooperation with stakeholders. For transforming, the results showed that two of the analyzed startups use different methods to manage relations with their stakeholders and that this activity can be considered essential for the sustainable innovation of these companies. In addition, the companies analyzed have lean organizational structures with few hierarchical levels. On the other hand, startups are generally able to transform themselves more easily than other companies, as they have fewer assets and procedures established to redesign (Teece, 2018). A summary of the processes and activities related to each dynamic capability is presented in Table 9.

Concerning sustainable business model innovation, evidence found was related to eight of the nine archetypes studied. This demonstrates that the archetypes proposed by Bocken *et al.* (2014) are a useful framework for understanding sustainable business model innovation in the logistics sector.

No.	Evidence	Source
1	"When the person makes the first transaction and sends or takes an order, we survey to find out how it went"	The interview
2	"We do not have a community focused on technology, on the enterprise, on the world of startups (. . .) so the difficulty is this, you find pairs of people who are going through the same situation and that you can share information with"	The interview
3	"We believe in collaborative solutions, in the strength that exists when people come together, in the sharing economy"	OBRcollab website
4	"We intend to start in small and medium-sized cities because it is where we identify that there is more need and where our business can generate income (. . .)"	The interview

Source(s): Research data

Table 8. Evidence from the OBRcollab case (translated from Portuguese)

Dynamic Capabilities	Processes	Activities
Sensing	Sensing from internal sources	Market research activities
		Measurement of environmental and/or social impacts
		Sustainability as a strategy guide
		Analysis of internal metrics
		Meeting with employees
		Team with multidisciplinary knowledge
	Sensing from market sources	Dialog with customers and future customers
		Dialog with competitors
		Monitoring digital media of customers and future customers
		Dialog with other companies in the sector
	Sensing from other sources	Monitoring sustainable initiatives by different stakeholders
		Following up on publications and applicable legislation
		Dialog with associations, institutes and/or accelerators
		Participation in events related to sustainability
		Dialog with other companies
Seizing	Launching sustainable products/services	Proactive development of solutions for the market
		Adaptation of services/products according to the business environment
		Conducting market research
	Cooperation with stakeholders	Use of idle spaces from other companies
		Partnership with cooperatives for positive impacts
		Cooperation with universities and/or research institutes
		Development of co-responsibility with end customers
		Collaborating with other stakeholders to complete resources and skills
	Integration of sustainable technologies or methodologies	Integration of methodology related to circular economy
		Using the bicycle as clean technology
		Using digital processes (reduced use of paper)
		Adopting solutions based on the collaborative economy
Transforming	Work organization	Adoption of organizational structure in network
		Organization with few hierarchical levels
	Knowledge management	Decentralization of knowledge
		Flexibility to participate in different networks/areas of the company
		Facilitating access to information between different networks/areas of the company
		Continuous work to disseminate the values among company employees
	External relations management	Adoption of open innovation strategy
		Alliances with companies
		Outsourcing

Source(s): Research data

Table 9.
Sustainable dynamic capabilities

In the case of KBRloop, evidence of seven archetypes was found. In general, the company's value proposition is linked to the generation of positive social, environmental and economic impacts. As a social impact, the company emphasizes that the direct work with recycling cooperatives aims to improve the quality of life of the people who do the work. As an environmental impact, by recycling materials that would probably go to landfills, it is possible to avoid the extraction of raw materials, and consequently the generation of new negative environmental impacts. The interviewee also comments that there is an economic impact on society since in Brazil much money is spent to land waste, and with the services provided by the company, part of this waste generates a new economic value. In addition, according to the interviewee, the three types of impacts are very connected, which makes their dissociation difficult.

As for LBRcargo, evidence found was related to eight archetypes, however the evidence in three of them was considered limited, that is, the company performs some type of activity that is related to innovation, but in an incipient way. The value proposition of LBRcargo is aligned with financial issues by ensuring business scalability, with environmental issues, mainly reducing emissions of polluting gases, and social issues by valuing social inclusion.

Finally, four sustainable business model archetypes were identified in OBRcollab. The organization's value proposition is mainly related to economic and social criteria. However, environmental impacts can also be perceived due to the potential reduction in emissions.

The archetypes adopted by each startup are summarized in Table 10. The results show that four of the archetypes are applied by the three startups: "Maximize material and energy efficiency," "Repurpose for society/environment," "Create inclusive value" and "Develop sustainable scale-up solutions." In this sense, it can be verified that despite having different business models, all cases share ultimate goals (i.e. create value for stakeholders, shareholders, society and the environment by doing more with fewer resources and seeking scale-up solutions).

Moreover, the only archetype not contemplated was "Deliver functionality, not ownership." This archetype is mainly designed for companies that change their business model from selling a manufactured product to the integrated offer of services that add value to use (Yip and Bocken, 2018). Therefore, in the case of the companies studied (service providers), no evidence was found regarding this archetype. Nevertheless, servitization is an important trend that can affect other companies in the logistics sector (Strandhagen *et al.*, 2017). An example of application in the sector would be the supply of logistics equipment through the pay-per-use method. Another innovation would be creating sharing logistics platforms, thus allowing the exchange of physical assets such as storage space, pallets, forklifts or vehicles between companies or public administrations (Qiu *et al.*, 2015).

Concerning the archetype "Close resource loops," it is fully applied by one company (KBRloop) and partially by another (LBRcargo). In this sense, it is relevant to highlight that this archetype can be directly linked to the logistic activity of reverse logistics. Hence, even if it is not the main activity of the company, as is the case of the startup LBRcargo, adopting this archetype represents a relevant market niche for future companies, since the management of reverse flows is one of the biggest challenges to achieving the circular economy (Dev *et al.*, 2020).

The archetypes "Substitute with renewables and natural processes" and "adopt a stewardship role," which present evidence related to one and two startups, respectively, are also opportunities for the logistics sector. The reduction of carbon emission, especially in the

Archetype	KBRloop	LBRcargo	OBRcollab
Maximize material and energy efficiency	X	X	X
Close resource loops	X	P	–
Substitute with renewables and natural processes	–	X	–
Deliver functionality rather than ownership	–	–	–
Adopt a stewardship role	X	X	–
Encourage sufficiency	X	P	–
Repurpose for society/environment	X	X	X
Create inclusive value	X	P	X
Develop sustainable scale-up solutions	X	X	X

Note(s): (X) Applied by the company; (P) Partially applied; (–) Not applied
Source(s): Research data

Table 10. Archetypes of sustainable business models per startup

last mile of delivery, is one of the main challenges that urban logistics must face (Kauf, 2016); thus, solutions based on renewable energy or natural process must be incorporated.

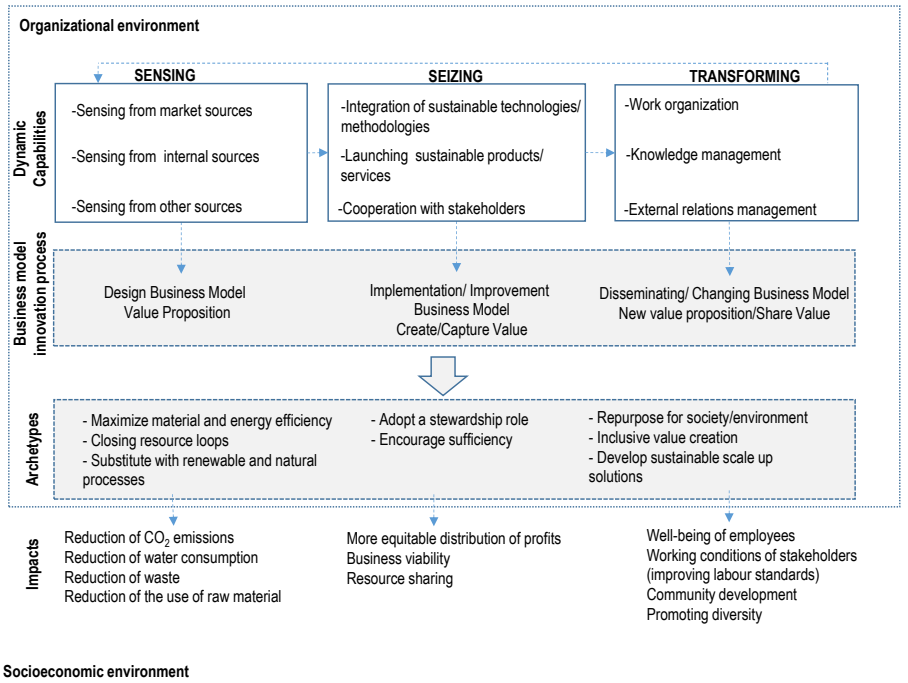
Evidence for the archetype "Encourage sufficiency" was found in activities of two startups, although in one of them in an incipient way. This archetype is about slowing down consumption and incorporating it as part of the business model. Therefore, it could not be compatible with short-term profit targets (Bocken *et al.*, 2014). However, this model can increase customer loyalty, as it is a model that consumers positively value (Yip and Bocken, 2018). In addition to the examples carried out by the startups studied, in the field of logistics, this innovation could be applied by labeling the carbon footprinting of the delivery, in addition to raising awareness that in some cases, a slower delivery may be more sustainable.

Therefore, based on the evidence from the three case studies, in relation to P1 "sensing dynamic capabilities are associated with sustainable business model innovation," the results showed that the startups carry out sensing from internal and external sources, that is, they perform activities such as the measurement of environmental and/or social impacts, or the analysis of internal metrics, in addition to maintaining a dialog with other stakeholders. It was also evident that sensing dynamic capabilities are relevant to identifying and evaluating unmet opportunities that lead to the design of sustainable business model innovation. Therefore, the empirical results support the first proposition. However, as Inigo *et al.* (2017) suggested, companies must proactively align customer expectations and sustainable goals. For example, according to the interviewee with LBRcargo, some customers are mainly interested in faster deliveries. Therefore, the company must know how to communicate its value proposition and manage external pressures that may conflict with its values.

For P2 "seizing dynamic capabilities are associated with sustainable business model innovation," the companies surveyed use different strategies to allocate resources in order to create and capture value from a sustainable value proposal. In this sense, activities related to seizing dynamic capabilities, such as cooperation with stakeholders or integration of sustainable technologies or methods, help to implement and improve sustainable business model innovations. According to the literature review (Bocken and Geradts, 2020; Sun *et al.*, 2021), collaboration with partners is an important piece of becoming more sustainable, and for startups, this could be even more relevant since these partnerships allow some initiatives to have a larger scale and reach more people. Thus, the empirical evidence corroborates the second proposition.

Lastly, the results for P3 "transforming dynamic capabilities are associated with sustainable business model innovation" showed that the companies studied have a lean and/or flexible organizational structure. Also, in two of the cases analyzed, the establishment of strategic relationships with stakeholders was identified. These characteristics are related to transforming dynamic capabilities and help transform aspects of the organization in order that companies can proactively reposition themselves against market threats and opportunities by innovating their business models. Unlike traditional companies, the excessive focus on exploitation may not be considered a critical barrier to sustainable innovation (Bocken and Geradts, 2020); however, the lack of a supporting startup ecosystem could inhibit the changes. In this way, the empirical results support proposition 3. The following framework (Figure 3) summarizes the main findings.

This conceptual framework establishes clear connections between capabilities, business model innovation processes, business models archetypes and the environmental, social and economic impacts, which responds to recent calls for in-depth research on the internal drivers for sustainable business model innovation (Bocken and Geradts, 2020; Evans *et al.*, 2017), and the adaptation of approaches from the literature on business model innovation (Pieroni *et al.*, 2019). More specifically, the framework shows how the set of business model archetypes can contribute to reducing social and environmental negative effects (e.g. atmospheric



Source(s): Prepared by the authors

Figure 3.
Dynamic capabilities and sustainable business model innovation

contamination, traffic congestion and high energy consumption) while also creating value for the company and stakeholders (Kauf, 2016; Lan and Zhong, 2018).

6. Conclusions

This study aimed to analyze the association between dynamic capabilities and sustainable business model innovation of startups in the Brazilian logistics sector. To achieve this objective, a qualitative approach was used through a multiple case study in Brazilian startups.

The results of the study demonstrated that the dynamic capabilities of sensing, seizing, and transforming are associated with sustainable business model innovation. Furthermore, dynamic capabilities can be considered internal drivers that promote innovation in sustainable business models, since the conception until the dissemination or change. In this sense, the three theoretical propositions were supported by the empirical results found.

As the main contributions of the study, the diffusion of a model that jointly addresses the theory of dynamic capabilities and sustainable business model innovation can be highlighted. At the theoretical level, it is a useful alternative for understanding the internal drivers and management of business model innovation. Furthermore, this paper extends the sustainable business model archetypes application (Bocken *et al.*, 2014) to the logistics sector. Third, the focus on startups helps improve our understanding of the sustainable dynamics capabilities of these type of companies, and how they employ these capabilities to deal with environmental, social and economic challenges. In this sense, in line with previous research (Inigo *et al.*, 2017) the study shows that the startups with the most disruptive business models are those with the greatest dynamic capabilities.

As a managerial practice, the findings contribute to the diffusion of sustainable initiatives in the logistics sector, as well as in other companies and industries of different segments and sizes. In the case of Brazil, it is clear that there is a long way to go toward a sustainable transition; however, given the greater global awareness and environmental issues such as climate change, the pressures for sustainable models will increase in the coming years. Given this scenario, the results represent business opportunities for startups and large companies. Innovations related to the archetypes were addressed in light of the cases and the reviewed literature. For example, activities related to "encourage sufficiency," such as labeling the carbon footprint of the delivery, were pointed as alternatives to the traditional business models.

In addition, this work can help managers better understand dynamic capabilities, that is, how to incorporate them into the organization's strategic activities aimed at the different dynamic capabilities addressed in this work to make a sustainable transition. Although dynamic capabilities can be considered unique resources (Teece, 2007), an in-depth analysis of the related processes and activities shows that the results provide insights that can be integrated into management efforts to achieve sustainable innovation. For example, companies should implement internal metrics to measure environmental and social impacts to improve sensing capabilities. Additionally, managers from traditional logistics companies must consider collaborating with startups as a starting point to develop and incorporate sustainable business models.

Despite the efforts made to improve this investigation, the study has as its main limitations the understanding of the phenomenon through the perception of only one respondent from each company. Although the researchers in this study selected informants with substantial knowledge of the organization and the business environment, the use of only one informant may contain certain biases. To overcome this limitation, the informants were asked to support their words with real examples that could be contrasted with the secondary data sources used. Another limitation refers to the opening of companies in relation to strategic issues. In this sense, some questions were not further explored by the interviewees. In future studies, qualitative research can be carried out to compare the reality of startups or small companies with large established companies in the sector. Another future direction may be the construction and validation of a quantitative research instrument adapted to the service sector since the majority of quantitative studies are related to the manufacturing context.

It is also recommended that public policymakers create policies, such as incentive programs and regulations that encourage the development of a business ecosystem aimed at supporting companies with sustainable and innovative initiatives, not only in large urban centers, but also other regions.

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Appendix
Interview protocol

Dynamic capabilities

A - Sensing

1. Does the company have a source within the company for identifying economic, social and environmental opportunities and challenges (such as Research and Development activities)? If yes, please provide examples
2. Does the company have procedures in place to regularly identify the company's environmental and/or social impacts? If yes, in what way?
3. Does the company use any source of information from the market (suppliers, competitors, other companies in the industry, customers, or future customers) to identify economic, social and environmental opportunities and challenges? If yes, please provide examples
4. Does the company use any other external information sources to identify economic, social and environmental opportunities and challenges (e.g. educational institutions, conferences, trade shows and scientific journals)? If yes, please provide examples

B – Seizing

5. Has the company launched any product or service into the market with a sustainable value proposition? If yes, please provide examples
6. Does the company have any form of cooperation with market partners (suppliers, customers or other companies in the industry)? If yes, in what way?
7. Does the company have any form of cooperation with knowledge partners (universities, research institutes, commercial laboratories among others)? If yes, please provide examples
8. Has the company integrated any form of clean technology and/or sustainability-oriented methods recently? If yes, please provide examples

C – Transforming

9. Does the company have a differentiated method for organizing work responsibilities and decision making (sustainability-oriented innovation teams, decentralization, etc.)? If yes, please provide examples
10. Does the company have any way to manage and decentralize the knowledge of sustainable business thinking within the company? If yes, please provide examples
11. If the company collaborates with other organizations, what methods are used to manage these relationships (alliances, partnerships, outsourcing, etc.)?

Sustainable business model innovation

12. How does the company define its business model?
13. Does the company have practices to improve energy/hydric efficiency? If yes, please provide examples
14. Does the company have practices oriented at using renewable energy or clean technologies? If yes, please provide examples
15. Does the company produce products and/or services using fewer resources, aiming at reducing waste, emissions and pollution? If yes, please provide examples
16. Does the company have any process for reusing materials and products or transforming waste into raw materials for other products/processes? If yes, please provide examples
17. Does the company innovate in products and production processes to introduce renewable resources and energy and design new solutions by imitating natural systems? If yes, in what way?
18. Does the company have alternatives for substituting products by services – Product-Service System (PSS)? If yes, in what way?
19. Does the company have practices to ensure the well-being of stakeholders/partners (employees, clients, suppliers and shareholders)? If yes, in what way?

(*continued*)

20. Does the company have actions that encourage final consumers' sustainable consumption or adopt more sustainable lifestyles? If yes, in what way?
21. In what ways does the company seek sustainable solutions to maximize benefits for society and the environment?
22. How does the company promote its integration with local communities and stakeholders/partners to generate social and environmental benefits?
23. Does the company have any mechanism for sharing resources, knowledge, and/or property (collaborative platforms/sharing, peer-to-peer)? If yes, please comment
24. Does the company provide any mechanisms to maximize sustainability benefits (sustainability incubators and collaboration/crowdsourcing platforms)? If yes, please comment

Corresponding author
Diéssica Oliveira-Dias can be contacted at: oliveira@ujaen.es