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Analyzing the Attractiveness of Businesses to Receive Investments for a Creative and Innovative Transition to a Circular Economy: The Case of the Textile and Fashion Industry

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Abstract: Excessive and often compulsive consumption has given the textile–fashion industry the reputation of being one of the industries causing the most pollution in today's world. For this reason, there is a necessity for a transition from a linear to a circular approach in the textile–fashion industry. However, this is not an easy task, especially when considering the investments that must be made to put a circular economy structure into practice. In this sense, the transition to a circular economy in the textile–fashion industry presents a unique opportunity for businesses to attract investments to support this transition by leveraging creativity and innovation to reduce waste, minimize resource consumption, and increase the longevity of products and materials. Therefore, this study sets out to develop a multicriteria decision support model to measure the attractiveness of businesses to receive investments that aim at aiding the transition to the circular economy. The model uses the "play card" from Simos' procedure and the Normalize software that provide a comprehensive, consistent, and transparent approach to decision making, which can help investors to evaluate the attractiveness of investment opportunities and identify businesses that have the potential for long-term success in the circular economy. Hence, catalyzing and obstructing factors of the circular economy discussed in the literature were selected to underpin the analysis model and to draw up robust investment recommendations to the investors. In addition to the scientific contributions of the model, indications are also provided to the private sector, public policy makers, and society on how sustainability can be driven by the circular economy.

Keywords: circular economy; creative ecosystem; business investments; business attractiveness

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1. Introduction

Parallel to the growth and economic contribution of the textile and fashion industry, the intensive use of natural resources (such as water and energy) and toxic inputs (chemical components) has transformed this industry into one of the most polluting industries in the world [1]. The textile and fashion industry is responsible for around 10% of global greenhouse gas emissions and consumes more energy than the aviation and shipping industries combined [2]. Moreover, the equivalent of one garbage truck full of textiles is landfilled or burned every second [3]. Corroborating with this scenario, the number of garments produced annually has doubled since 2000 and is expected to reach 102 million tons by 2030 [4].

Furthermore, the fast-fashion phenomenon, which works with many brands producing multiple collections per year and encouraging customers to buy and dispose of clothing quickly, is driving the growth of the textile and fashion industry's environmental

negative impacts, as reported by [5]. Data about the fast-fashion phenomenon show that the average number of times a garment is worn before it is discarded has decreased by 36% in the past 15 years [6]. Moreover, only 1% of textiles are currently recycled into new clothing, with most clothing either landfilled, incinerated, or downcycled into lower-value products [7]. If current trends continue, the fashion industry's carbon footprint will increase by 50% by 2030 [3].

These findings highlight the urgent need for a more sustainable and circular approach to fashion, with a focus on reducing waste, improving recycling and reuse, and shifting towards more sustainable materials and production methods [8].

Furthermore, the processes of a considerable part of the textile and fashion industry are characterized by mass and low-cost manufacturing, with increasingly shorter product life cycles, which respond to the traditional model of a linear economy [1]. Linked to these issues, there is also this industry's inadequate disposal of waste and rejects into the environment, which results in a substantial increase in the negative impacts in environmental, social, and economic terms [9].

On the other hand, the number of consumers, researchers, practitioners, and governments, hereinafter called stakeholders, who are environmentally aware and who are interested in and encourage the acquisition of products from companies that adopt sustainable practices is also growing in the world, contributing to social and economic development [10–12]. Hence, there is pressure from these stakeholders to value eco-efficiency and gains related to sustainability that prompt companies to acquire sustainable habits, and hence to move away from the traditional linear business model to the circular one [13–15].

The circular economy (CE), based on principles of closed loops, considers business organizations as part of a system, the actions and decisions of which must balance economic prosperity with the protection of the environment and social interests [16–18]. This eco-efficient production and consumption system mainly involves the transformation of used goods into raw materials for another production cycle and its ideal objective is "zero waste" by means of the "Rs": repair, reuse, reform, remanufacture, reduce, and recycle [4,6,10]. Thus, the circular economy is an alternative that can reduce the impact of the textile–fashion industry, but this requires a systemic change in product design, business models, and supply chains.

This systemic change involves (a) reducing waste and pollution (i.e., this involves reducing the amount of waste and pollution generated during the production and consumption process), (b) designing for circularity (i.e., this involves designing products and processes that can be reused, repaired, or recycled), (c) implementing new business models (i.e., the circular economy requires new business models that prioritize the reuse and recycling of resources), (d) collaboration across the value chain (i.e., achieving a circular economy requires collaboration across the entire value chain, from raw material suppliers to end-of-life disposal), and (e) encouraging consumer behavior change (i.e., consumers play a critical role in the transition to a circular economy; encouraging behavior change can be achieved through education and awareness campaigns, as well as providing incentives for more sustainable consumption patterns) [6,19].

Although there are already companies that were founded on and guided by sustainability principles from their inception, called born-sustainable business models, most of the companies in operation still need to make a transition from the linear to the circular model [16]. A business model describes how the organization creates and delivers value. Hence, the transformation of business models towards the CE requires systemic and multi-level thinking, in addition to innovations, whether incremental and/or radical, so that these models become a source of competitive advantage, and thus can take on and overcome competitors that do not opt for this change [7–20].

The development of sustainable and creative business models is essential to fulfil the principles of the CE in fast-growing sectors such as the textile–fashion industry [21]. Exploring the existing literature on the CE in the textile–fashion industry, studies on the

most varied topics were identified, such as the circular behavior of consumers [8], circular business models [22], key performance indicators for CE [23], circular technologies [24], and collaborative and decision-making support approaches [3,25]. Although [3,25] argued for decision support approaches that direct efforts to transition businesses to the CE in the textile–fashion industry, they do not contemplate assessing the attractiveness of a business as to its receiving investments that support its transition process. This reaffirms the innovative nature and necessity of this study.

In addition to these studies, there are others that have analyzed how business models in the textile industry transition to sustainable and creative business models in the CE. The approach proposed by [26], for example, identified options for circular strategies to be introduced in traditional business models in the textile–fashion industry and used the multicriteria analytic hierarchy process (AHP) method to select one of the alternatives. Moreover, [2] proposed a machine learning model to assist business managers in the sector in classifying post-consumer textile wastes so that they can be directed to the recovery cycle of the correct value. However, these authors run into issues of scalability, incompatibility with value propositions for customers, and obstacles in the supply chain itself [27].

From these studies, it is clear that not all business models are prepared to take advantage of the opportunities and advantages that the CE can bring, since they do not have the necessary investments to carry out the transition towards the CE [28]. With an insufficient level of their own resources, companies need to resort to external sources to finance these processes, for which they must have a sufficient level of attractiveness for investors [29]. For their part, investors are willing to invest their financial resources temporarily, but available only to potentially profitable projects or assets [30]. Thus, the decision on whether to apply resources by an investor is directly affected by the attractiveness of the investment [29,30]. However, methodologies that help government agencies and/or potential investors to assess the attractiveness of investments in the CE in business, especially in the textile–fashion industry, have not yet been sufficiently developed, and thus they require being improved and updated [3,31]. Therefore, this is a gap in the literature.

Therefore, the objective of this study was to propose a model to analyze the attractiveness of businesses with regard to their receiving investments in order to carry out a creative and sustainable transition to the CE. It is known that the adoption of this new model by government bodies and/or potential investors is an important and necessary differential in order to direct the efforts of companies to preserve the environment and human life. Furthermore, as stated by [32], more empirical research is needed to address the issue of how the CE is adopted in practice by companies according to the investments made. This article contributes to this end.

2. Materials and Methods

The model developed to assess the attractiveness of businesses with regard to their receiving investments and making a creative and sustainable transition to the CE is divided into four stages, as can be seen in Figure 1.

2.1. Planning

In this step, the problem situation is structured. First, note that there is an analyst/specialist to conduct the procedure. He/she should hold planning meetings to explain to the decision maker (DM) how the entire methodological procedure will be conducted. Here, the DM will be the investor (S_I).

Then, the alternatives to the problem must be identified. In this case, they represent companies (x_i), where $i = \{1, 2, 3, 4, ..., b\}$, which need investment to undertake a creative and sustainable transition to the CE.

As evaluation criteria, the factors that influence the transition of the organizational level to the CE will be used. To identify the criteria, we have conducted a systematic literature review and adopted the search protocol proposed by [18]. By reviewing the literature, it was observed that there are two main categories: (F_C) catalysts and (F_O)

obstacles. The catalysts factors, or drivers, are those that make the transition to the CE viable, i.e., those that motivate companies to implement the new business model and/or facilitate the transition process. On the other hand, obstacles factors, or barriers, consist of those that may discourage or obstruct the transition to circular business operations [18]. Figure 2 summarizes the search protocol and filtering process of the articles that were analyzed.

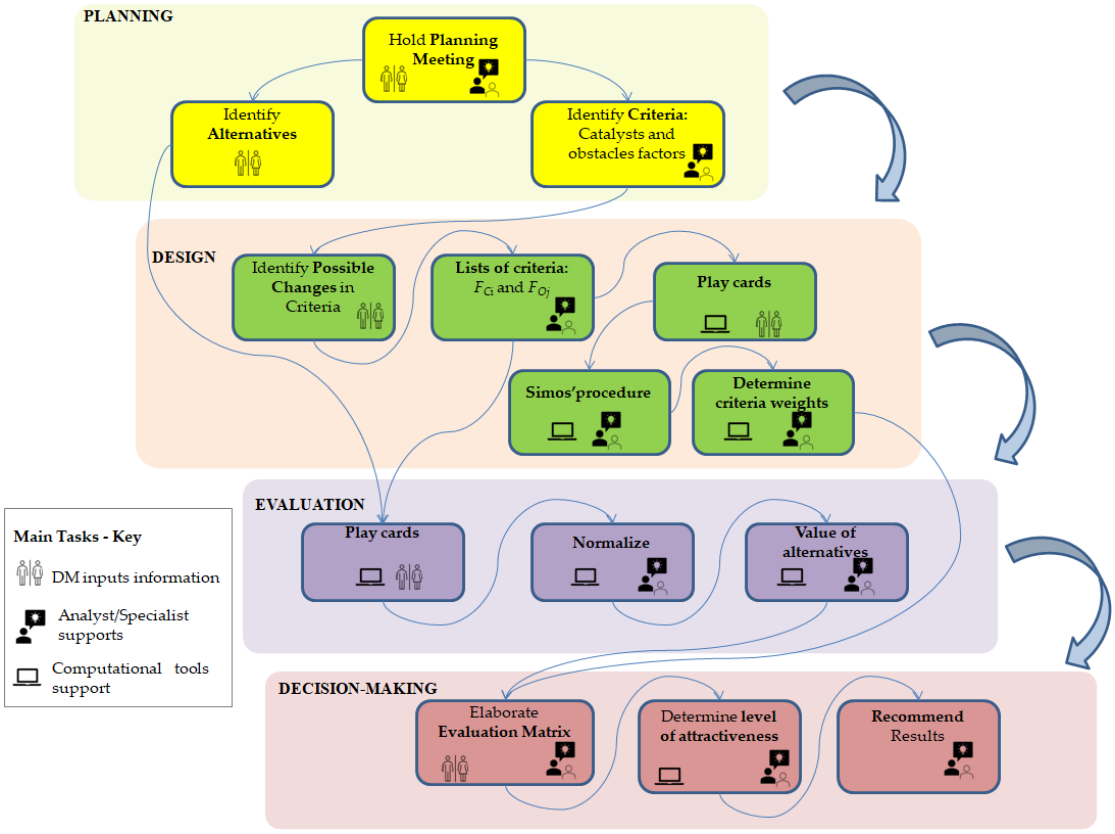


Figure 1. Proposed model.

As a result of this step, the catalysts and obstacles factors were surveyed and presented in Section 4 and Tables 4 and 5. After that, we can go to the design step.

2.2. Design

With the help of the analyst, the DM (S_I) must define which of the catalysts and obstacles factors must be considered in the decision-making process. The DM can suggest changes to or elimination of factors. Therefore, as a result, two lists of criteria will be formed: one list with the catalysts factors (FC_k), where $k = \{1, 2, 3, \ldots, n\}$, and the other with the obstacles (FO_k), where $k = \{1, 2, 3, \ldots, m\}$. The catalysts factors are seen here as desired strengths in a company (alternative) for it to be chosen to receive investments, i.e., it is desired to maximize the performance of the alternative in these factors (criteria). Meanwhile, the obstacles factors are seen as weaknesses where minimization is desired.

Furthermore, the DM (S_I) should evaluate the factors that influence the transition from the organizational level to the CE according to their importance for decision making. To do so, he will need to determine the weights of each factor in the two groups (catalysts and obstacles). Weight assessment is commonly understood as a complex activity.

Hence, [33] proposed a dynamic of the 'play cards', called Simos' procedure. We have selected this procedure to be used in our model for the following reasons [34]:

- Comprehensive assessment, as the Simos' procedure provides comprehensive assessment of alternatives based on multiple criteria, which can help to identify the best alternative or rank them in order of preference.

- Consistency, as the Simos' procedure provides a consistent and standardized approach to decision making, which helps to ensure that the criteria are applied consistently across different alternatives and contexts.
- Transparency, as the use of a decision-making methodology based on the Simos' procedure provides a transparent and systematic approach to decision making, which can increase confidence in the decision-making process.
- Flexibility, as the Simos' procedure can be adapted to different decision-making contexts and can incorporate different criteria depending on the specific needs of the decision maker.
- Validity and reliability, as the Simos' procedure has been validated and shown to be reliable in decision making, which increases confidence in the accuracy and consistency of the decision-making process.

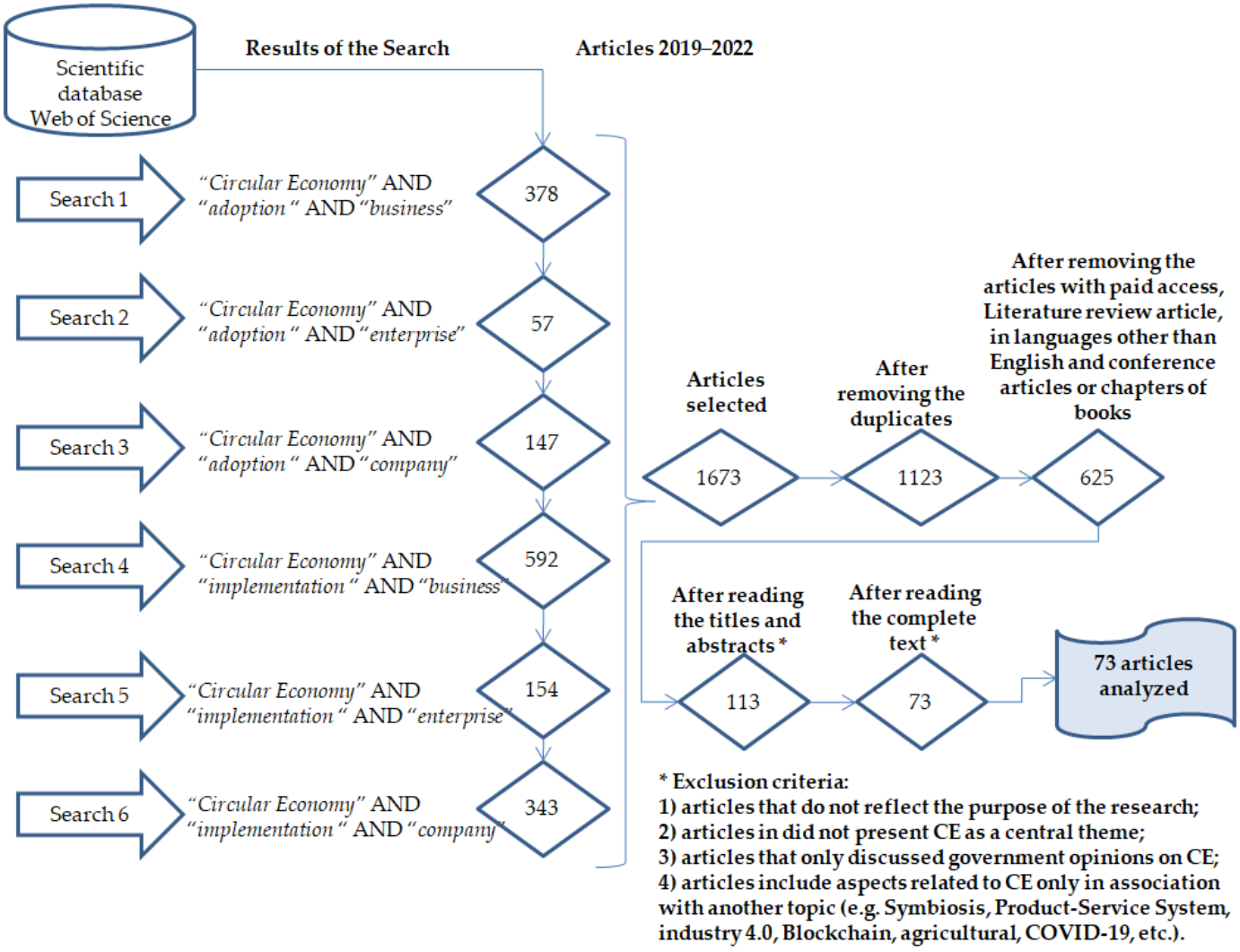


Figure 2. Protocol for searching for and filtering articles.

Overall, the use of the Simos' procedure provides a comprehensive, consistent, and transparent approach to decision making, which can help decision makers identify the best alternative or rank them in order of preference based on multiple criteria [33,34].

Basically, this procedure consists of giving the DM some 'white' cards and other cards containing the names of the factors. Then, the DM must evaluate the factors from the least to the most important, thus ranking them. Each card represents a unit (u). Therefore, the white cards must be inserted between the cards containing the names of the factors when

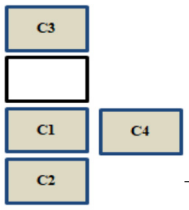
the difference in importance between subsequent factors is considered to be greater than one unit u [33,34].

Having defined the rankings, it is then possible to determine the weights for each factor according to its position in the ranking. A widely used procedure is expressed by Equation (1), where the value of the normalized weight of the criterion $v'(C_k)$ is the proportion (ratio scale) between its position in the ranking $v'(C_k)$ and the sum of the position of all criteria evaluated in the ranking $v'(C_k)$:

$$v'(C_k) = \frac{v(C_k)}{\sum v(C_k)} \quad (1)$$

However, Equation (1) fails to properly define criteria weights when the difference in preference between criteria is greater than one position. Thus, Simos' procedure is an adaptation to the normalization of Equation (1), illustrated in Table 1, solving this problem, respecting the sum of weights equal to 1.

Table 1. Simos' procedure for criteria.

Play Cards	Subset of Criteria	Number of Cards	Position	Non-Normalized Weight	Normalized Weight
Least  Most	C_3	1	1	1	$\frac{1}{13} = 0.08$
	white card	1	(2)	- - - -	- - - - -
	C_1 and C_4	2	3 and 4	$\frac{3+4}{2} = 3.5$	$\frac{3.5}{13} = 0.27$
	C_2	1	5	5	$\frac{5}{13} = 0.38$
	Sum		13 *		

* The sum does not include the position of the white cards. Source: Adapted from [33].

As a result of the example in Table 1, the weights of criteria C_1, C_2, C_3, and C_4 are, respectively, $w_{C1} = 0.27$, $w_{C2} = 0.38$, $w_{C3} = 0.08$, and $w_{C4} = 0.27$.

2.3. Evaluation

The evaluation of the alternatives (companies) must be conducted by specialists. In these cases, it is normal to hire outsourced companies that carry out the assessment in loco in an impartial manner. The catalysts and obstacles factors are of a qualitative nature, and therefore, the evaluation of the companies will follow a qualitative evaluation. In this type of decision, normally, the intra-criteria evaluation of the alternatives is made using pre-defined scales, e.g., a 5- or 9-point Likert scale. However, many DMs may feel uncomfortable dealing with pre-fixed scales, because the ideal values range changes from DM to DM [35].

Here, to establish a level of attractiveness formed by aggregating the evaluations, i.e., an evaluation of the inter-criteria alternatives, the qualitative scales must be transformed into a numerical scale [3]. The transformation of the Likert scale is often questioned and difficult to understand, since something considered "very good" in different criteria can also mean different values [33]. If there is compensation between assessments, this intensity of the difference between the scales will directly impact the final result [5].

Thus, here, we also proposed the dynamic of the 'play cards' procedure. This procedure allows a global visualization of both the order of preference for the alternatives and the intensity of preference between them. Here, the procedure must be used for each criterion k individually. After the 'play cards' procedure, each alternative (company) x_i, where $i = \{1, 2, \ldots, b\}$, will have a final position in the ranking of criterion k represented by the value $v_k(x_i)$. Therefore, the normalized value $v'_k(x_i)$ will be given by Equation (2).

$$v'_k(x_i) = 100 \times [v_k(x_i) - Min\ v_k(x_i)]/[Max\ v_k(x_i) - Min\ v_k(x_i)] \quad (2)$$

This procedure allows the final scale to contain values between 0 (worst) and 100 (best). Here, Simos' procedure is not used because we understand that proportionality is not desired when aggregating the different rankings in the next stage of the model. An interval scale is recommended as given by Equation (2) [35]. To facilitate this step, the Normalize software, developed by [35], illustrated in Table 2, can be used. As in the Simos' procedure, white cards influence the value $v_k(x_i)$, but are not considered in the decision process.

Table 2. Normalized values for alternatives.

Alternatives	Number of Cards	Position	Normalized
x_1	1	1	$v'k(x_1) = 100 \times ([4-1]/[4-1]) = 100$
x_3, x_4	2	2	$v'k(x_3) = v'k(x_4) = 100 \times ([4-2]/[4-1]) \approx 66.67$
White card	(1) *	3	- - - - - - - -
x_2, x_5	2	4	$v'k(x_2) = v'k(x_5) = 100 \times ([4-4]/[4-1]) = 0$

Source: Adapted from [35]. * The sum does not include the position of the white cards.

2.4. Decision Making

After the criteria and alternatives evaluation steps, a criteria versus alternatives evaluation matrix can be drawn up, as shown in Table 3.

Table 3. Evaluation matrix model.

	Catalysts (FC_k), k={1, 2,..,n}				**Obstacles (FO_k), k={1,2,..,m}**			
Alternatives (x_i), i = {1, 2, ..b}	FC_1	FC_2	...	FC_n	FO_1	FO_2	...	FO_m
	w_{FC_1}	w_{FC_2}	...	w_{FC_n}	w_{FO_1}	w_{FO_2}	...	w_{FO_m}
x_1	$v'_{FC_1}(x_1)$	$v'_{FC_2}(x_1)$	...	$v'_{FC_{Cn}}(x_1)$	$v'_{FO_1}(x_1)$	$v'_{FO_2}(x_1)$	...	$v'_{FC_{Om}}(x_1)$
x_2	$v'_{FC_1}(x_2)$	...	...	...	$v'_{FO_1}(x_2)$	...	...	...
...	...	...	...	...	...	...	...	...
x_b	$v'_{FC_1}(x_b)$	...	...	$v'_{FC_n}(x_b)$	$v'_{FO_1}(x_b)$	...	...	$v'_{FO_m}(x_b)$

If it is understood that the catalysts are positive factors and the obstacles are negative factors, the investment attractiveness of alternative x_i, (At_{x_i}) will be given by Equation (3).

$$At_{x_i} = \sum_{k=1}^{n} \left(FC_k(x_i) \times w_{FC_k}\right) - \sum_{k=1}^{m} \left(FO_k(x_i) \times w_{FO_k}\right) \quad (3)$$

The one with the highest attractiveness value should be recommended.

3. Results

For the numerical application of the model, suppose a situation in which a foundation that supports technological development issues a public notice regarding the selection of companies in the textile and fashion industry which will undertake the transition from the traditional model to the circular business model. These notices are becoming common in countries such as Brazil. This occurs as a way to encourage local companies, especially small and medium-sized ones, to modernize by using innovative processes such as those proposed by the CE. However, there are limited resources for investment, which leads to the need for a selection of these companies.

In this case, the investor is represented by a manager or group of managers of the investing institution. Subsequently, the evaluation criteria must be defined. The alternatives will be all the companies that apply to be included as set out in the notice. Following the steps of the proposed model, resulting from the literature review carried out (Figure 2), the main subcategories of company internal and external catalysts and obstacles were identified and summarized, as shown in Tables 4 and 5, respectively. These two lists should be presented to the DM (or group of DMs) for analysis.

Table 4. Subcategories of the catalyzing factors.

Code	Subcategories	Number of Articles	Authors
C1	Organizational and business model (innovative/flexible organizational culture, leadership strategy, manager awareness, etc.)	37	[16,17,28,36–70]
C2	Company reputation (brand) and market share	09	[14,38,40,43,45,55,59,71,72]
C3	Regulatory aspects (laws, certifications, etc.)	14	[16,28,32,37,39,40,42,46,50,58,62,71,73,74]
C4	Customer awareness and engagement trend, and social concern	19	[37,39,40,42,43,45,46,48,50,51,54,55,57,58,65,66,70,75,76]
C5	Available technology and innovation in production process (resource efficiency)	29	[16,17,21,32,37,39,40,43,46,49–52,54,58,59,61,69–71,73,74,76–80]
C6	Environmental, economic, and social benefits (triple bottom line)	26	[14,32,54,56,57,59,60,62,63,68–70,72,75,79–87]
C7	Supply chain management (collaboration, integration, modernization, partnerships, outsourcing, "green suppliers", globalization, geographical proximity, and networking)	29	[14,17,28,32,37,40,50–54,57,61,63–65,68,69,71,73,74,76,80,81,83,84,88–90]
C8	Economic aspects: financial resource available or cost reduction	10	[21,40,41,43,45,46,50–52,91]
C9	New product, eco-design, and/or circular design (product/materials)	10	[17,38–40,43,45,47,67,72,79]
C10	Knowledge/skills and information management	15	[8,21,47,58,65,66,69–71,73,74,81,91–93]
C11	Public policies, governance, and local initiatives	9	[8,28,39,42,58,68,70,71,91]

Table 5. Subcategories of the obstacles factors.

Code	Subcategories	Number of Articles	Authors
O1	Legal and/or regulatory aspects that make it difficult to reuse by-products	22	[8,14,28,44,45,50,51,58,60,62,65,68,74,79,87,91,94–98]
O2	Cultural barriers (absence of innovative organizational culture)	29	[21,28,39–41,46,50,51,56–58,60,61,65,66,69,81,82,87,89,91,93,94,96,98–101]
O3	Economic and/or financial barriers (more expensive materials and technologies)	31	[14,17,21,37,39–41,45,46,50,52,56,57,62,63,69–71,79,82,85,87,95–101]
O4	Barriers in the supply chain (lack of integration and alignment between links)	17	[16,42,45,46,50,57,58,63,69,70,81,87,95,97–99,101]
O5	Technical and/or operational barriers (difficulties in disassembling, inspecting, and reusing products/immaturity of technological solutions)	20	[16,37,38,40,46,50,52,57,62,63,66,79,81,87,94,96–99,101,102]
O6	Technological barriers (lack/cost)	17	[14,38–40,46,50,51,58,66,81,87,93,95,97–99,101]
O7	Lack of government support (external support) and/or public policies	18	[14,21,37,40,44–46,52,58,62,65,66,69,73,87,91,97,100]
O8	Lack of performance indicators	6	[57,70,81,85,86,98]
O9	Lack of infrastructure	10	[37,56–58,66,69,93,95,98,99]
O10	Lack of strategic vision (company's current business model)	11	[28,40,58,62,69,75,88,93,95,97–99]
O11	Lack of commitment and/or leadership from organizational management	13	[40,44,46,50,52,57,62,65,81,90,97–99]
O12	Market barriers: immaturity of the market, lack of consumer awareness	13	[45,52,53,67,72,76,77,80,83–85,103,104]
O13	Uncertainties about the associated risks or risk aversion	16	[14,40,41,46,47,60,61,63,65,71,80,87,97–99,103]
O14	quality and quantity (availability) of inputs that affect production and consequent quality of the final product	11	[14,40,47,52,65,70,79,97–99,101]

Observing the literature, specifically focused on the transition to CE in the textile and fashion industry, it is clear that all the catalysts are cited, even though, properly speaking, they are not described in this way. Among the studies, we draw attention to [2,4,7,10,13,16,19,21,25,102,104–108]. In relation to the environmental, economic, and

social benefits (triple bottom line), catalyst C6, all authors mention its importance. However, a strong orientation towards the environmental aspect was identified, especially with the study of processes and eco-efficient materials.

Nevertheless, for the case described here, catalysts C6 and C11 can be disregarded, since they are already being represented by the public notice initiative itself, which is the same for all alternatives (companies). If the announcement is specific to a single sector, such as textiles and fashion, factors C3 and C4 can also be disregarded in the analysis, based on the assumption that all companies will be involved in the same environment.

The main barriers reported in the literature, specifically related to the textile and fashion industry, that stand out are O4, O5, and O10 [16]; O6 [106]; and O8 [98,109]. Barriers O1, O2, O3, O7, O9, O11, O12, O13, and O14 were not clearly identified in this study for the sector of interest. This may occur due to the tendency of studies to highlight the benefits of the CE to justify their work. In addition, the obstacles factors O1, O7, and O12 can also be disregarded for the case because they are companies in the same sector governed by the same public notice.

Having delimited the factors, now the DM needs to determine the importance of each one (weights), according to step 2 of the proposed model. Illustratively, suppose as a result the rankings presented in Table 6, in which the play cards were randomly generated.

Table 6. Simos' procedure for determining the criteria weights.

Catalysts			
Play Cards	**Code**	**Position**	**Weight**
Least important C8 C10 C5 C9 C1 C2 C7 Most important	C1	6	0.18
	C2	7	0.21
	C5	3.5	0.10
	C7	11	0.32
	C8	1	0.03
	C9	3.5	0.10
	C10	2	0.06
Obstacles			
Play Cards	**Code**	**Position**	**Weight**
Least important O5 O8 O6 O10 O4 Most important	O4	8	0.40
	O5	1	0.05
	O6	4.5	0.225
	O8	2	0.10
	O10	4.5	0.225

Suppose that five companies applied in response to the public notice. Following the proposed model, the evaluation of these companies in each criterion follows by play cards procedure in which they are compared to each other. Here, the position in the play cards was generated by a random variable. The values in Table 7 were obtained.

Table 7. Evaluation matrix for the numerical application.

	Catalysts							**Obstacles**				
	FC_1	**FC_2**	**FC_5**	**FC_7**	**FC_8**	**FC_9**	**FC_{10}**	**FO_4**	**FO_5**	**FO_6**	**FO_8**	**FO_{10}**
Weight	0.18	0.21	0.1	0.32	0.03	0.1	0.06	0.40	0.05	0.225	0.10	0.225
x_1	5	1	3	8	1	8	5	4	5	1	7	4
x_2	1	2	5	2	3	4	3	1	6	3	10	1
x_3	7	3	6	6	7	1	1	2	1	4	1	4
x_4	6	1	1	9	2	8	1	8	1	5	5	4
x_5	8	5	7	1	4	6	2	3	6	2	5	5

After normalizing the positions in the rankings of the evaluation of the alternatives (Table 7), Equations (2) and (3) are applied. The result is summarized in Table 8.

Table 8. Final result.

Alternatives	**Catalysts**	**Obstacles**	**At_{x_i}**	**Ranking**
	$\sum_{k=1}^{n}(FC_k(x_i)\times w_{FC_k})$	$\sum_{k=1}^{m}(FO_k(x_i)\times w_{FO_k})$		
x_1	42.38	55.30	−12.90	4th
x_2	75.80	73.80	2.00	2nd
x_3	42.74	60.50	−17.80	5th
x_4	44.64	16.20	28.50	1st
x_5	40.86	51.00	−10.10	3rd

Based on the result of Table 8, the alternative recommended to receive the investment and carry out a transition process to a circular, creative, innovative, and sustainable business model is x_4.

4. Discussion

The CE is a key part of global efforts towards a paradigm shift that considers the social, environmental, and economic challenges of predatory stances with respect to sustainability [49]. The activities linked and developed by the CE aim to rethink excessive consumption, minimize waste, and, whenever possible, to replenish natural resources with a view to their maximum regeneration [83]. In this sense, circular business models are considered as drivers for this paradigm shift to happen [12]. However, the transition from a linear to a circular economy requires innovative business models [39]. To make this transition possible, new financial instruments and investments are imperative to support the growth and development of businesses that are not yet circular but intend to make the transition [62].

In the wake of public and private initiative, there is growth in the number of investors and financial institutions at the national and/or international level that identify in the CE a positive structure to deal with the transition issues [64]. Hence, decision instruments are needed to facilitate the process of analysis and to choose those businesses that have the potential to receive investments and achieve the objectives of the CE.

From this perspective, in the model developed in the present study, it can be seen from Tables 4 and 5 which are the factors considered in the analysis and surveyed in the literature with ambivalent behavior, i.e., those that can act as catalysts or obstacles depending on the situation, circumstances, and other contextual factors [18]. Among these, we can highlight

the organizational aspects (C1, O2, O10, and O11). While the innovative culture and the interest of top management positively influence the adoption of the CE, companies that have a traditional, inflexible organizational culture and low interest from top management have difficulty in doing so in the CE [56,60,62,65].

Strict regulations regarding the reclassification of wastes, and its legal approval as a by-product, significantly delay the commercialization of the circular product. On the other hand, regulatory aspects encourage the reduction of waste and promote the development of new circular products [28,74].

By the same dynamics, since companies need to invest in the transition process, the economic aspects appear as obstacles (O3), but they can be understood as catalysts when there are financial resources available or cost reductions (C8) [21,40,41,45,46,50,52]. This point further justifies studies on the attractiveness of businesses to receive investments. We need to highlight that most of the studies emphasized sustainability aspects, in which the economic aspect comes in as one of the tripods. However, other studies have chosen to emphasize economic factors.

Furthermore, customer awareness (C4 and O12) is also considered as an ambivalent factor. While consumer demand for environmentally sustainable products is a catalyst, society's lack of knowledge in the environmental domain affects the activities of the process and the development of new products in the CE [56,65]. Supply chain management (SC) itself, when considering the relationships between internal and external links, can quickly promote the CE. However, the close partnership between companies requires a wide exchange of information and the availability of information on how to manage conflicts within the circular SCs is still limited [54,60,76].

Regarding the use of the "play card" from Simos' procedure, it is important to note that it brought benefits to the proposed model, as it requires less cognitive effort from the DM to assign weights to the criteria, a characteristic that can reduce the elicitation time, which is a limiting factor for investment decisions [33]. As a consequence of this, using the procedure could minimize the inconsistencies of the decision-making process, since the DM could evaluate and define in a simplified way the weights that he/she would consider in the decision-making process [33–35].

In addition, the procedure was incorporated into the Normalize software, which is a computational system based on the procedure to assist DMs in the evaluation process based on subjective criteria. This allows the alternatives to be quantified based on their position in the ranking, without establishing a standardized size for the scale. The software also provided the decision-making process with visual tools in order to show how its evaluation is performed, which further facilitates the DM to verify if his/her preferences are being respected [35].

Regarding the recommendation of the alternatives to the investor, it can be seen that some alternatives have a negative At_{x_i} index due to the global evaluation performed. This poses two important issues for the DM. The first is that when the At_{x_i} index is negative, it is understood that investing in that business at that moment is not attractive for the investor based on the factors that he/she has considered in the analysis [3].

The second issue is that the investor needs to understand that the negative At_{x_i} index also means that that business, when placed together with the other investments in its portfolio, has a negative synergy. That is, it may not generate scalable gains in economic, environmental, and social terms, which are both good for its business portfolio and for the development of the CE [5].

It is also important to point out that although the alternative presents a negative At_{x_i} index for a specific investment, this does not mean that that business is unable to receive investments from any other financial institution or investor. On the contrary, this business may be able to receive investments from financial institutions or investors who have different investment profiles from the one initially attempted [26].

Moreover, this business can use the factors in which its performance caused its At_{x_i} index to be negative as a benchmark for readjustments and adjustments that are necessary

for a future analysis, since there are levels of operational maturity, and progress towards continuous and systemic improvement can be important for the long-term sustainability of the business [56].

Sensitivity Analysis

To assess the reliability of the model in relation to the recommendations on the investment that should be made in the business for the transition process towards the CE, a sensitivity analysis was carried out in which the weights of the factors considered were varied and, consequently, so too was their impact on the recommendation given.

Hence, scenarios were prepared to guide the sensitivity analysis. In scenario 1, equal weights were considered for all factors. Therefore, in scenario 2, variations in weights in the dimensions of −5%, −15%, and −25% were considered. Finally, for scenario 3, variations in weights in the dimensions of +5%, +15%, and +25% were considered. The literature points out that for the model to be considered robust, substantial changes in the recommendations cannot occur when the model is evaluated comparatively to the scenario initially proposed [110]. Table 9 summarizes the results.

Table 9. Sensitivity analysis.

Alternative	Scenario 0		Scenario 1	
	Original Weights	**Ranking**	**Equal Weights (1/n)**	**Ranking**
x_1	−12.9	4th	−1.1	3rd
x_2	2.0	2nd	17.1	2nd
x_3	−17.8	5th	−21.6	5th
x_4	28.5	1st	22.7	1st
x_5	−10.1	3rd	−4.2	4th
Scenario 2				
Alternative	**−5%**	**Ranking**	**−15%**	**Ranking**	**−25%**	**Ranking**
x_1	−12.3	4th	−11.0	4th	−9.7	4th
x_2	1.9	2nd	1.7	2nd	1.5	2nd
x_3	−16.9	5th	−15.1	5th	−13.3	5th
x_4	27.0	1st	24.2	1st	21.3	1st
x_5	−9,6	3rd	−8.6	3rd	−7.6	3rd
Scenario 3						
Alternative	**+5%**	**Ranking**	**+15%**	**Ranking**	**+25%**	**Ranking**
x_1	−13.6	4th	−14.9	4th	−16.2	4th
x_2	2.2	2nd	2.4	2nd	2.6	2nd
x_3	−18.7	5th	−20.5	5th	−22.2	5th
x_4	29.9	1st	32.7	1st	35.6	1st
x_5	−10.7	3rd	−11.7	3rd	−12.7	3rd

Observing Table 9, based on the sensitivity analysis carried out, we concluded that the model is robust enough for investment recommendations in businesses to transition to the CE, since there were no substantial changes in the potential of companies on the factors used in the decision process. Company x_4 stayed in first place in all scenarios. Reversal of the ranking order was observed only in scenario 1, but between the 3rd and 4th positions. However, it is important to point out that this type of scenario (equal weights) only happens when the investor wants to refrain from generating this information for the analytical process, which is an atypical situation, especially when it comes to capital to be invested.

In summary, the result of the developed model can help investors in (a) adopting a robust and quantitative methodology, mitigating the problems that involve subjectivity in complex problems; (b) defining an investment prioritization rank, which is very useful when there is no interest and/or not enough financial resources to invest in all companies; and (c) establishing a minimum performance for companies to receive investment,

so companies will only be financed if they fulfill a specific (quantitative) performance, i.e., the model allows companies to better understand quantitatively their strengths and weaknesses, once again mitigating subjectivity. Thus, the model serves as a mechanism for developing these companies and improving the decision-making process, helping investors to evaluate the attractiveness of investment opportunities and identify businesses that have the potential for long-term success in the circular economy.

5. Conclusions

The objective of the present study was to propose a multicriteria decision support model to assess the attractiveness of businesses with regard to their receiving investments that help them to carry out a creative, innovative, and sustainable paradigm shift towards the CE.

The model was proposed considering catalytic and obstacles factors of the CE surveyed from the literature review in combination with the "play card" from Simos' procedure and implemented by the Normalize software, which allows a structured, intuitive, and innovative approach in the analysis of business attractiveness so that the possible alternatives of investment may be evaluated by the private sector or by the public sector.

A numerical application of the model was conducted in a realistic case in the textile and fashion industry to validate the model and verify its replicability. Despite having been applied in the context of this industry, the model proves to be suitable for any sector of the economy and/or industry that needs grounded support and for analyzing the attractiveness of investment in businesses that wish to make the change to the CE. In addition, a sensitivity analysis was conducted to verify the robustness of the model and it proved to be reliable regarding the recommendations made to investors based on the scenarios used.

This study brings concrete contributions to theory, practice, and society.

Theoretical, Practical and Social Implications

For researchers and the scientific community, the study draws attention to the development of strategies that minimize barriers to investments in the CE with well-defined roadmaps and strategies that can have capillarity, i.e., they are known by all at the national and international level, and internalization, i.e., they can be put into practice without major difficulties.

With regard to the private sector, especially financial institutions and investors, it can be seen that they are under increasing demands for their projects to include issues related to socio-environmental responsibility, in addition to the economic issues that they are already familiar with. Thus, investing in business projects that catalyze and develop the CE is a way to adapt to these demands. However, these financial institutions and investors must promote evaluation processes based on ethics and equity, so that, in particular, small and medium-sized companies that find it most difficult to obtain an investment have a real chance of obtaining it.

For the public initiative, the study points out that it is urgent to raise investments from private financial institutions and investors, since only the capital made available by the federal government is not enough to finance all the necessary infrastructure for the change to a CE to occur. It is also observed that for the volume of capital that is directed to the circular model to exceed the volume of capital directed to the linear one, policy makers need to work to develop measures that reduce the underlying risks of financial investors in the CE, making the CE an opt-in rather than an opt-out decision when considering investment options.

Last but not least, for society, the study considers the individual as an important player in the transition process. Thus, it is required that, socially, there is a fundamental rethinking about consumption practices and about how the individual can be an important link in his/her community with respect to disseminating CE strategies and practices that have been taking shape, thus taking a step forward towards a future that can meet everyone's needs without causing major discomfort.

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References

1. Bukhari, M.A.; Carrasco-Gallego, R.; Ponce-Cueto, E. Developing a national programme for textiles and clothing recovery. *Waste Manag. Res.* **2018**, *36*, 321–331. [CrossRef] [PubMed]
2. Riba, J.-R.; Cantero, R.; Canals, T.; Puig, R. Circular economy of post-consumer textile waste: Classification through infrared spectroscopy. *J. Clean. Prod.* **2020**, *272*, 123011. [CrossRef]
3. Oliveira Silva, W.D.; Morais, D.C. Impacts and insights of circular business models' outsourcing decisions on textile and fashion waste management: A multi-criteria decision model for sorting circular strategies. *J. Clean. Prod.* **2022**, *370*, 133551. [CrossRef]
4. Stål, H.I.; Corvellec, H. A decoupling perspective on circular business model implementation: Illustrations from Swedish apparel. *J. Clean. Prod.* **2018**, *171*, 630–643. [CrossRef]
5. Silva, W.D.O.; Fontana, M.E. Integrative multi-attribute negotiation model to define stakeholders' responsibilities in the reverse flow channel. *J. Clean. Prod.* **2021**, *279*, 123752. [CrossRef]
6. Dragomir, V.D.; Dumitru, M. Practical solutions for circular business models in the fashion industry. *Clean. Logist. Supply Chain* **2022**, *4*, 100040. [CrossRef]
7. Niinimäki, K. Fashion in a Circular Economy. In *Sustainability in Fashion*; Henninger, C., Alevizou, P., Goworek, H., Ryding, D., Eds.; Palgrave Macmillan: Cham, Switzerland, 2017.
8. Evans, S.; Peirson-Smith, A. The sustainability word challenge Exploring consumer interpretations of frequently used words to promote sustainable fashion brand behaviors and imagery. *J. Fash. Mark. Manag.* **2018**, *22*, 252–269.
9. Spathas, T. The Environmental Performance of High Value Recycling for the Fashion Industry LCA for Four Case Studies. Ph.D. Thesis, Chalmers University of Technology, Gothenburg, Sweden, 2017.
10. Cai, Y.-J.; Choi, T.-M.; Zhang, T. Commercial used apparel collection operations in retail supply chains. *Eur. J. Oper. Res.* **2021**, *298*, 169–181. [CrossRef]
11. Mejías, A.M.; Bellas, R.; Pardo, J.E.; Paz, E. Traceability management systems and capacity building as new approaches for improving sustainability in the fashion multi-tier supply chain. *Int. J. Prod. Econ.* **2019**, *217*, 143–158. [CrossRef]
12. Wu, H.J.; Su, J.; Hodges, N.N. Investigating the Role of Open Costing in the Buyer-Supplier Relationship: Implications for Global Apparel Supply Chain Management. *Cloth. Text. Res. J.* **2023**, *41*, 154–169. [CrossRef]
13. Jensen, F.; Whitfield, L. Leveraging participation in apparel global supply chains through green industrialization strategies: Implications for low-income countries. *Ecol. Econ.* **2022**, *194*, 107331. [CrossRef]
14. Jesus, G.M.K.; Jugend, D.; Paes, L.A.B.; Siqueira, R.M.; Leandrin, M.A. Barriers to the adoption of the circular economy in the Brazilian sugarcane ethanol sector. *Clean Technol. Environ. Policy* **2023**, *25*, 381–395. [CrossRef]
15. Wang, Y.; Fan, D.; Fung, Y.-N.; Luo, S. Consumer-to-consumer product exchanges for original fashion brands in the sharing economy: Good or bad for fashion knockoffs? *Transp. Res. Part E Logist. Transp. Rev.* **2022**, *158*, 102599. [CrossRef]
16. Ostermann, C.M.; da Nascimento, L.S.; Steinbruch, F.K.; Callegaro-de-Menezes, D. Drivers to implement the circular economy in born-sustainable business models: A case study in the fashion industry. *Rev. Gestão* **2021**, *28*, 223–240. [CrossRef]
17. Prieto-Sandoval, V.; Jaca, C.; Santos, J.; Baumgartner, R.J.; Ormazabal, M. Key strategies, resources, and capabilities for implementing circular economy in industrial small and medium enterprises. *Corp. Soc. Responsib. Environ. Manag.* **2019**, *26*, 1473–1484. [CrossRef]
18. Sarja, M.; Onkila, T.; Mäkelä, M. A systematic literature review of the transition to the circular economy in business organizations: Obstacles, catalysts and ambivalences. *J. Clean. Prod.* **2021**, *286*, 125492. [CrossRef]
19. Bressanelli, G.; Visintin, F.; Saccani, N. Circular Economy and the evolution of industrial districts: A supply chain perspective. *Int. J. Prod. Econ.* **2022**, *243*, 108348. [CrossRef]
20. Rumble, R.; Minto, N.A. How to use analogies for creative business modelling. *J. Bus. Strat.* **2017**, *38*, 76–82. [CrossRef]

21. Daňo, F.; Drábik, P.; Hanuláková, E. Circular Business Models in Textiles and Apparel Sector in Slovakia. *Cent. Eur. Bus. Rev.* **2020**, *9*, 1–19. [CrossRef]
22. Han, S.L.C.; Chan, P.Y.L.; Venkatraman, P.; Apeagyei, P.; Cassidy, T.; Tyler, D.J. Standard vs. Upcycled Fashion Design and Production. *Fash. Pract.* **2017**, *9*, 69–94. [CrossRef]
23. Chae, Y.; Hinestroza, J. Building Circular Economy for Smart Textiles, Smart Clothing, and Future Wearables. *Mater. Circ. Econ.* **2020**, *2*, 2. [CrossRef]
24. Yousef, S.; Tatariants, M.; Tichonovas, M.; Kliucininkas, L.; Lukošiūtė, S.-I.; Yan, L. Sustainable green technology for recovery of cotton fibers and polyester from textile waste. *J. Clean. Prod.* **2020**, *254*, 120078. [CrossRef]
25. Fischer, A.; Pascucci, S. Institutional incentives in circular economy transition: The case of material use in the Dutch textile industry. *J. Clean. Prod.* **2017**, *155*, 17–32. [CrossRef]
26. Paras, M.; Curteza, A.; Varshneya, G. Identification of best reverse value chain alternatives A study of Romanian used clothing industry. *J. Fash. Mark. Manag.* **2019**, *23*, 396–412.
27. Pal, R.; Gander, J. Modelling environmental value: An examination of sustainable business models within the fashion industry. *J. Clean. Prod.* **2018**, *184*, 251–263. [CrossRef]
28. Mura, M.; Longo, M.; Zanni, S. Circular economy in Italian SMEs: A multi-method study. *J. Clean. Prod.* **2020**, *245*, 118821. [CrossRef]
29. Binda, J.B.; Prokopenko, M.; Ramskyi, A.; Shuplat, O.; Halan, L.; Mykhaylenko, D. Assessment of investment attractiveness of industrial enterprises. *Int. J. Manag.* **2020**, *11*, 27–35.
30. Strokov, A.I. The methodological aspects of assessing the attractiveness of investments made into financial assets and real projects. *Life Sci. J.* **2014**, *11*, 682–686.
31. Akhmetshin, E.M.; Artemova, E.I.; Vermennikova, L.V.; Shichiyakh, R.A.; Prodanova, N.A.; Kuchukova, N.M. Management of investment attractiveness of enterprises: Principles, methods, organization. *Int. J. Appl. Bus. Econ. Res.* **2017**, *15*, 71–82.
32. Urbinati, A.; Rosa, P.; Sassanelli, C.; Chiaroni, D.; Terzi, S. Circular business models in the European manufacturing industry: A multiple case study analysis. *J. Clean. Prod.* **2020**, *274*, 122964. [CrossRef]
33. Simos, J. L'évaluation Environnementale: Un Processus Cognitif Négocié. Ph.D. Thesis, DGF-EPFL, Lausanne, Switzerland, 1990.
34. Figueira, J.; Roy, B. Determining the weights of criteria in the ELECTRE type methods with a revised Simos' procedure. *Eur. J. Oper. Res.* **2002**, *139*, 317–326. [CrossRef]
35. Fontana, M.E.; Nepomuceno, V.S. Computational system for quantitative intra-criterion evaluation in subjective criterion. In Proceedings of the International Conference of Production Research, ICPR—Americas 2020, Bahía Blanca, Argentina, 9–11 December 2020.
36. Al-Awlaqi, M.A.; Aamer, A.M. Individual entrepreneurial factors affecting adoption of circular business models: An empirical study on small businesses in a highly resource-constrained economy. *J. Clean. Prod.* **2022**, *379*, 134736. [CrossRef]
37. Barford, A.; Ahmad, S.R. Levers for a corporate transition to a plastics circular economy. *Bus. Strat. Environ.* **2022**. *ahead-of-print*. [CrossRef]
38. De Vass, T.; Nand, A.A.; Bhattacharya, A.; Prajogo, D.; Croy, G.; Sohal, A.; Rotaru, K. Transitioning to a circular economy: Lessons from the wood industry. *Int. J. Logist. Manag.* **2022**. *ahead-of-print*. [CrossRef]
39. Guzzo, D.; Pigosso, D.; Videira, N.; Mascarenhas, J. A system dynamics-based framework for examining Circular Economy transitions. *J. Clean. Prod.* **2022**, *333*, 129933. [CrossRef]
40. Khan, S.A.; Mubarik, M.S.; Paul, S.K. Analyzing cause and effect relationships among drivers and barriers to circular economy implementation in the context of an emerging economy. *J. Clean. Prod.* **2022**, *364*, 132618. [CrossRef]
41. von Kolpinski, C.; Yazan, D.M.; Fraccascia, L. The impact of internal company dynamics on sustainable circular business development: Insights from circular startups. *Bus. Strat. Environ.* **2022**. *ahead-of-print*. [CrossRef]
42. Luthra, S.; Kumar, A.; Sharma, M.; Garza-Reyes, J.A.; Kumar, V. An analysis of operational behavioural factors and circular economy practices in SMEs: An emerging economy perspective. *J. Bus. Res.* **2022**, *141*, 321–336. [CrossRef]
43. Mathivathanan, D.; Mathiyazhagan, K.; Khorana, S.; Rana, N.P.; Arora, B. Drivers of circular economy for small and medium enterprises: Case study on the Indian state of Tamil Nadu. *J. Bus. Res.* **2022**, *149*, 997–1015. [CrossRef]
44. Shooshtarian, S.; Hosseini, M.R.; Kocaturk, T.; Arnel, T.; Garofano, N.T. Circular economy in the Australian AEC industry: Investigation of barriers and enablers. *Build. Res. Inf.* **2023**, *51*, 56–68. [CrossRef]
45. Piila, N.; Sarja, M.; Onkila, T.; Mäkelä, M. Organisational Drivers and Challenges in Circular Economy Implementation: An Issue Life Cycle Approach. *Organ. Environ.* **2022**, *35*, 523–550. [CrossRef]
46. Agyemang, M.; Kusi-Sarpong, S.; Khan, S.A.; Mani, V.; Rehman, S.T.; Kusi-Sarpong, H. Drivers and barriers to circular economy implementation: An explorative study in Pakistan's automobile industry. *Manag. Decis.* **2019**, *57*, 971–994. [CrossRef]
47. Albertsen, L.; Richter, J.L.; Peck, P.; Dalhammar, C.; Plepys, A. Circular business models for electric vehicle lithium-ion batteries: An analysis of current practices of vehicle manufacturers and policies in the EU. *Resour. Conserv. Recycl.* **2021**, *172*, 105658. [CrossRef]
48. Barbaritano, M.; Bravi, L.; Savelli, E. Sustainability and Quality Management in the Italian Luxury Furniture Sector: A Circular Economy Perspective. *Sustainability* **2019**, *11*, 3089. [CrossRef]
49. Cantú, A.; Aguiñaga, E.; Scheel, C. Learning from Failure and Success: The Challenges for Circular Economy Implementation in SMEs in an Emerging Economy. *Sustainability* **2021**, *13*, 1529. [CrossRef]

50. Çetin, S.; Gruis, V.; Straub, A. Towards Circular Social Housing: An Exploration of Practices, Barriers, and Enablers. *Sustainability* **2021**, *13*, 2100. [CrossRef]
51. Corral-Marfil, J.-A.; Arimany-Serrat, N.; Hitchen, E.L.; Viladecans-Riera, C. Recycling Technology Innovation as a Source of Competitive Advantage: The Sustainable and Circular Business Model of a Bicentennial Company. *Sustainability* **2021**, *13*, 7723. [CrossRef]
52. Dey, P.K.; Malesios, C.; De, D.; Budhwar, P.; Chowdhury, S.; Cheffi, W. Circular economy to enhance sustainability of small and medium-sized enterprises. *Bus. Strat. Environ.* **2020**, *29*, 2145–2169. [CrossRef]
53. Eikelenboom, M.; De Jong, G. The Impact of Managers and Network Interactions on the Integration of Circularity in Business Strategy. *Organ. Environ.* **2021**, *35*, 365–393. [CrossRef]
54. Gandolfo, A.; Lupi, L. Circular economy, the transition of an incumbent focal firm: How to successfully reconcile environmental and economic sustainability? *Bus. Strategy Environ.* **2021**, *30*, 3297–3308. [CrossRef]
55. Garrido-Prada, P.; Lenihan, H.; Doran, J.; Rammer, C.; Perez-Alaniz, M. Driving the circular economy through public environmental and energy R&D: Evidence from SMEs in the European Union. *Ecol. Econ.* **2021**, *182*, 106884. [CrossRef]
56. Jugend, D.; de Camargo Fiorini, P.; Pinheiro, M.A.P.; Da Silva, H.M.R.; Pais Seles, B.M.R. Building circular products in an emerging economy: An Initial Exploration Regarding Practices, Drivers and Barriers Case studies of new product development from medium and large Brazilian companies. *Johns. Matthey Technol. Rev.* **2020**, *64*, 59–68. [CrossRef]
57. Mendoza, J.M.F.; Gallego-Schmid, A.; Azapagic, A. A methodological framework for the implementation of circular economy thinking in higher education institutions: Towards sustainable campus management. *J. Clean. Prod.* **2019**, *226*, 831–844. [CrossRef]
58. Moktadir, M.A.; Ahmadi, H.B.; Sultana, R.; Fatema-Tuj-Zohra; Liou, J.J.H.; Rezaei, J. Circular economy practices in the leather industry: A practical step towards sustainable development. *J. Clean. Prod.* **2020**, *251*, 119737. [CrossRef]
59. Ortega-Gras, J.-J.; Bueno-Delgado, M.-V.; Cañavate-Cruzado, G.; Garrido-Lova, J. Twin Transition through the Implementation of Industry 4.0 Technologies: Desk-Research Analysis and Practical Use Cases in Europe. *Sustainability* **2021**, *13*, 13601. [CrossRef]
60. Pereira, Á.; Vence, X. The role of KIBS and consultancy in the emergence of Circular Oriented Innovation. *J. Clean. Prod.* **2021**, *302*, 127000. [CrossRef]
61. Pesce, M.; Tamai, I.; Guo, D.; Critto, A.; Brombal, D.; Wang, X.; Cheng, H.; Marcomini, A. Circular Economy in China: Translating Principles into Practice. *Sustainability* **2020**, *12*, 832. [CrossRef]
62. Piyathanavong, V.; Garza-Reyes, J.A.; Kumar, V.; Maldonado-Guzmán, G.; Mangla, S.K. The adoption of operational environmental sustainability approaches in the Thai manufacturing sector. *J. Clean. Prod.* **2019**, *220*, 507–528. [CrossRef]
63. Ramkumar, S. Influence of Inter-Firm Network Relationships on Circular Economy Eco-Innovation Adoption. *Sustainability* **2020**, *12*, 7607. [CrossRef]
64. Torres-Guevara, L.E.; Prieto-Sandoval, V.; Mejia-Villa, A. Success Drivers for Implementing Circular Economy: A Case Study from the Building Sector in Colombia. *Sustainability* **2021**, *13*, 1350. [CrossRef]
65. Santa-Maria, T.; Vermeulen, W.J.V.; Baumgartner, R.J. Framing and assessing the emergent field of business model innovation for the circular economy: A combined literature review and multiple case study approach. *Sustain. Prod. Consum.* **2021**, *26*, 872–891. [CrossRef]
66. Sharma, Y.K.; Mangla, S.K.; Patil, P.P.; Liu, S. When challenges impede the process: For circular economy-driven sustainability practices in food supply chain. *Manag. Decis.* **2019**, *57*, 995–1017. [CrossRef]
67. Umeda, Y.; Kitagawa, K.; Hirose, Y.; Akaho, K.; Sakai, Y.; Ohta, M.; Center, T.J.P.; Shimbun, L.T.N.K. Potential Impacts of the European Union's Circular Economy Policy on Japanese Manufacturers. *Int. J. Autom. Technol.* **2020**, *14*, 857–866. [CrossRef]
68. Ünal, E.; Urbinati, A.; Chiaroni, D.; Manzini, R. Value Creation in Circular Business Models: The case of a US small medium enterprise in the building sector. *Resour. Conserv. Recycl.* **2019**, *146*, 291–307. [CrossRef]
69. Uvarova, I.; Atstaja, D.; Korpa, V. Challenges of the introduction of circular business models within rural SMEs of EU. *Int. J. Econ. Sci.* **2020**, *9*, 128–149. [CrossRef]
70. zu Castell-Rüdenhausen, M.; Wahlström, M.; Astrup, T.F.; Jensen, C.; Oberender, A.; Johansson, P.; Waerner, E.R. Policies as Drivers for Circular Economy in the Construction Sector in the Nordics. *Sustainability* **2021**, *13*, 9350. [CrossRef]
71. Parida, V.; Burström, T.; Visnjic, I.; Wincent, J. Orchestrating industrial ecosystem in circular economy: A two-stage transformation model for large manufacturing companies. *J. Bus. Res.* **2019**, *101*, 715–725. [CrossRef]
72. Urbinati, A.; Chiaroni, D.; Toletti, G. Managing the Introduction of Circular Products: Evidence from the Beverage Industry. *Sustainability* **2019**, *11*, 3650. [CrossRef]
73. Mishra, J.L.; Chiwenga, K.D.; Ali, K. Collaboration as an enabler for circular economy: A case study of a developing country. *Manag. Decis.* **2019**, *59*, 1784–1800. [CrossRef]
74. Sopelana, A.; Auriault, C.; Bansal, A.; Fifer, K.; Paiva, H.; Maurice, C.; Westin, G.; Rios, J.; Oleaga, A.; Cañas, A. Innovative Circular Economy Models for the European Pulp and Paper Industry: A Reference Framework for a Resource Recovery Scenario. *Sustainability* **2021**, *13*, 10285. [CrossRef]
75. Bielecka, A.; Kulczycka, J. Coal Combustion Products Management toward a Circular Economy—A Case Study of the Coal Power Plant Sector in Poland. *Energies* **2020**, *13*, 3603. [CrossRef]
76. Jäger, J.K.; Piscicelli, L. Collaborations for circular food packaging: The set-up and partner selection process. *Sustain. Prod. Consum.* **2021**, *26*, 733–740. [CrossRef]

77. Charnley, F.; Knecht, F.; Muenkel, H.; Pletosu, D.; Rickard, V.; Sambonet, C.; Schneider, M.; Zhang, C. Can Digital Technologies Increase Consumer Acceptance of Circular Business Models? The Case of Second Hand Fashion. *Sustainability* **2022**, *14*, 4589. [CrossRef]
78. Neligan, A.; Baumgartner, R.J.; Geissdoerfer, M.; Schöggl, J. Circular disruption: Digitalisation as a driver of circular economy business models. *Bus. Strat. Environ.* **2022**, *32*, 1175–1188. [CrossRef]
79. Stumpf, L.; Schöggl, J.-P.; Baumgartner, R.J. Climbing up the circularity ladder?—A mixed-methods analysis of circular economy in business practice. *J. Clean. Prod.* **2021**, *316*, 128158. [CrossRef]
80. Zucchella, A.; Previtali, P. Circular business models for sustainable development: A "waste is food" restorative ecosystem. *Bus. Strat. Environ.* **2019**, *28*, 274–285. [CrossRef]
81. Mendoza, J.M.F.; Gallego-Schmid, A.; Azapagic, A. Building a business case for implementation of a circular economy in higher education institutions. *J. Clean. Prod.* **2019**, *220*, 553–567. [CrossRef]
82. Brendzel-Skowera, K. Circular Economy Business Models in the SME Sector. *Sustainability* **2021**, *13*, 7059. [CrossRef]
83. Bressanelli, G.; Saccani, N.; Perona, M.; Baccanelli, I. Towards Circular Economy in the Household Appliance Industry: An Overview of Cases. *Resources* **2020**, *9*, 128. [CrossRef]
84. Cantele, S.; Moggi, S.; Campedelli, B. Spreading Sustainability Innovation through the Co-Evolution of Sustainable Business Models and Partnerships. *Sustainability* **2020**, *12*, 1190. [CrossRef]
85. Cornejo-Ortega, J.L.; Dagostino, R.M.C. The Tourism Sector in Puerto Vallarta: An Approximation from the Circular Economy. *Sustainability* **2020**, *12*, 4442. [CrossRef]
86. De Angelis, R.; Feola, R. Circular business models in biological cycles: The case of an Italian spin-off. *J. Clean. Prod.* **2020**, *247*, 119603. [CrossRef]
87. Kumar, V.; Sezersan, I.; Garza-Reyes, J.A.; Gonzalez, E.D.; Al-Shboul, M.A. Circular economy in the manufacturing sector: Benefits, opportunities and barriers. *Manag. Decis.* **2019**, *57*, 1067–1086. [CrossRef]
88. Aarikka-Stenroos, L.; Chiaroni, D.; Kaipainen, J.; Urbinati, A. Companies' circular business models enabled by supply chain collaborations: An empirical-based framework, synthesis, and research agenda. *Ind. Mark. Manag.* **2022**, *105*, 322–339. [CrossRef]
89. Rhein, S.; Sträter, K.F. Corporate self-commitments to mitigate the global plastic crisis: Recycling rather than reduction and reuse. *J. Clean. Prod.* **2021**, *296*, 126571. [CrossRef]
90. Rincón-Moreno, J.; Ormazabal, M.; Álvarez, M.; Jaca, C. Shortcomings of Transforming a Local Circular Economy System through Industrial Symbiosis: A Case Study in Spanish SMEs. *Sustainability* **2020**, *12*, 8423. [CrossRef]
91. Zuofa, T.; Ochieng, E.G.; Ode-Ichakpa, I. An evaluation of determinants influencing the adoption of circular economy principles in Nigerian construction SMEs. *Build. Res. Inf.* **2023**, *51*, 69–84. [CrossRef]
92. Pham, T.T.; Kuo, T.-C.; Tseng, M.-L.; Tan, R.R.; Tan, K.; Ika, D.S.; Lin, C.J. Industry 4.0 to Accelerate the Circular Economy: A Case Study of Electric Scooter Sharing. *Sustainability* **2019**, *11*, 6661. [CrossRef]
93. Silva, F.C.; Shibao, F.Y.; Kruglianskas, I.; Barbieri, J.C.; Sinisgalli, P.A.A. Circular economy: Analysis of the implementation of practices in the Brazilian network. *Rev. Gestão* **2019**, *26*, 39–60. [CrossRef]
94. Malik, A.; Sharma, P.; Vinu, A.; Karakoti, A.; Kaur, K.; Gujral, H.S.; Munjal, S.; Laker, B. Circular economy adoption by SMEs in emerging markets: Towards a multilevel conceptual framework. *J. Bus. Res.* **2022**, *142*, 605–619. [CrossRef]
95. Aminoff, A.; Sundqvist-Andberg, H. Constraints leading to system-level lock-ins—The case of electronic waste management in the circular economy. *J. Clean. Prod.* **2021**, *322*, 129029. [CrossRef]
96. Garcés-Ayerbe, C.; Rivera-Torres, P.; Suárez-Perales, I.; Leyva-De La Hiz, D.I. Is It Possible to Change from a Linear to a Circular Economy? An Overview of Opportunities and Barriers for European Small and Medium-Sized Enterprise Companies. *Int. J. Environ. Res. Public Health* **2019**, *16*, 851. [CrossRef] [PubMed]
97. Silvius, G.; Ismayilova, A.; Sales-Vivó, V.; Costi, M. Exploring Barriers for Circularity in the EU Furniture Industry. *Sustainability* **2021**, *13*, 11072. [CrossRef]
98. Majumdar, A.; Ali, S.M.; Agrawal, R.; Srivastava, S. A triple helix framework for strategy development in circular textile and clothing supply chain: An Indian perspective. *J. Clean. Prod.* **2022**, *367*, 132954. [CrossRef]
99. Takacs, F.; Brunner, D.; Frankenberger, K. Barriers to a circular economy in small- and medium-sized enterprises and their integration in a sustainable strategic management framework. *J. Clean. Prod.* **2022**, *362*, 132227. [CrossRef]
100. Hanuláková, E.; Daňo, F.; Kukura, M. Transition of business companies to circular economy in Slovakia. *Entrep. Sustain. Issues* **2021**, *9*, 204–220. [CrossRef] [PubMed]
101. Jaeger, B.; Upadhyay, A. Understanding barriers to circular economy: Cases from the manufacturing industry. *J. Enterp. Inf. Manag.* **2020**, *33*, 729–745. [CrossRef]
102. Vehmas, K.; Raudaskoski, A.; Heikkila, P.; Harlim, A.; Mensonen, A. Consumer attitudes and communication in circular fashion. *J. Fash. Mark. Manag.* **2018**, *22*, 285–300. [CrossRef]
103. Frei, R.; Jack, L.; Krzyzaniak, S. Sustainable reverse supply chains and circular economy in multichannel retail returns. *Bus. Strat. Environ.* **2020**, *29*, 1925–1940. [CrossRef]
104. Moorhouse, D.; Moorhouse, D. Sustainable Design: Circular Economy in Fashion and Textiles. *Des. J.* **2017**, *20*, S1948–S1959. [CrossRef]
105. Cai, Y.-J.; Choi, T.-M. A United Nations' Sustainable Development Goals perspective for sustainable textile and apparel supply chain management. *Transp. Res. Part E Logist. Transp. Rev.* **2020**, *141*, 102010. [CrossRef]

106. Määttänen, M.; Asikainen, S.; Kamppuri, T.; Ilen, E.; Niinimäki, K.; Tanttu, M.; Harlin, A. Colour management in circular economy: Decolourization of cotton waste. *Res. J. Text. Appar.* **2019**, *23*, 134–152. [CrossRef]
107. Mukendi, A.; Henninger, C.E. Exploring the spectrum of fashion rental. *J. Fash. Mark. Manag. Int. J.* **2020**, *24*, 455–469. [CrossRef]
108. Wilson, L. The sustainable future of the Scottish textiles sector: Challenges and opportunities of introducing a circular economy model. *Text. Cloth. Sustain.* **2015**, *1*, 5. [CrossRef]
109. Virtanen, M.; Manskinen, K.; Uusitalo, V.; Syvänne, J.; Cura, K. Regional material flow tools to promote circular economy. *J. Clean. Prod.* **2019**, *235*, 1020–1025. [CrossRef]
110. Bana e Costa, C.A.; De Corte, J.M.; Vansnick, J.C. MACBETH (Measuring Attractiveness by a Categorical-Based Evaluation Technique). In *Wiley Encyclopedia in Operational Research and Management Science*; Cochrane, J.J., Ed.; Wiley: New York, NY, USA, 2011; Volume 4, pp. 2945–2950.