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Portugal's Footwear Industry: Looking for Sustainability Practices

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Abstract

Fashion and footwear industry (FWi) are major contributors to pollution. Still, FWi is committed to sustainability, looking for innovation, sustainable materials, and new business models. Creating sustainable value is challenging for these companies due to the variety of natural and synthetic materials, the need for suitable technology, reducing waste and preserving natural resources. This study adopts a qualitative research approach in 14 FW companies to building theory. We found that sustainable value is important for these companies, having some adopted sustainable practices with circular economy (CE) approach. This study identifies the barriers and drivers for implementing sustainable practices in FWi.

Keywords: Circular Economy; Footwear Industry; Innovation

Introduction

With the Industrial Revolution, manual labour was replaced by machines, improving efficiency and speed, and economic growth, as well as improving quality of life. Though, it also resulted in unrestrained consumption, which further depleted resources, damaged the ecosystem, and polluted the environment. As a result, greenhouse gas emissions increase, temperatures rise, and weather patterns change. Since the UN Conference on Environment and Development in 1992, efforts have been made, and in 2012, world leaders adopted the '10-Year Programme Framework for Sustainable Consumption and Production' (10YFP) and included it among the 17 Sustainable Development Goals (SDGs) adopted in 2015. As people become more aware and engaged with sustainability, companies are under pressure to develop social and environmental strategies. As a result, companies are now implementing sustainable consumption and production strategies and being held accountable. This is crucial to shift to sustainable consumption and production patterns, reducing environmental impacts. This will enable us to achieve the SDGs and ensure a sustainable future.

As fast and affordable fashion business models come at significant environmental and human costs, various stakeholders, such as NGOs, the media, and customers, have scrutinized the fashion industry. Brand-owned companies outsource production stages to low-cost economies that do not guarantee living wages, safe working conditions, or

environmental protection. Thus, accountability in the fashion industry has expanded beyond the boundaries of companies to include other supply chain stakeholders.

However, there is a wide range of materials on the market, along with different types of FW and design options that can lead to different environmental performances. Due to this, companies have difficulty implementing previous study recommendations and strategies. Business owners may also feel intimidated by transitioning to a more sustainable model. Most often, this is because it is difficult to change existing business models to ones that incorporate circular thinking and design into the product creation process (1st gap) and reduce waste along the value chain. In addition, factors related to financial and technological issues cause this problem. It can also be influenced by a certain scepticism of managers who have always worked similarly.

Additionally, no previous study recommended enhancing sustainable value creation by including shareholders' interests (2nd gap). Therefore, FW products need specific research to quantify and address their environmental impact, considering other aspects of sustainable value creation (3rd gap). As a result of the gaps and limitations mentioned above, this study aims to provide a deeper understanding of how FW businesses can use sustainability to gain a competitive advantage. To achieve this, it has outlined the measurement of the environmental impact of three types of FW, two of which are made from alternative materials. Additionally, it has determined its value to shareholders and stakeholders. The approach bridges the introduction of non-conventional materials to new business models in the FWi based on CE. Another purpose of the study is to identify the core issues behind the standard circular model and explore potential enablers of the new alternative business model for the FW industry. The abovementioned makes room for the following research questions:

RQ1 - What is the level of CE knowledge in the FW sector that enables companies to become more sustainable and reduce its environmental footprint?

RQ2 - Which fundamental sectors in the FWi should foster greater circularity, reuse, and recycling to accelerate rather than stall development?

RQ3 - What are the barriers and drivers to material circularity in the FWi? In what ways can circularity be improved?

This study, examining Portuguese FW manufacturers' perspectives on CE and its potential on the market, aims to establish relevant guidelines to seek confirmation of a conceptual business model addressing sustainability within the FWi towards CE. This should be able to leverage the competitive advantage in Portugal and the international arena according to the sector's characteristics. The remaining sections of this paper are organized as follows. First, an overview of sustainable value and circular thinking in the FW sector is presented in the theoretical background. Next, the methodology is described in the following section. Finally, the last section presents the results, conclusions, and suggestions for future research.

Theoretical Background

- *Sustainability and Circular Economy*

According to Ashby (2015), in a linear industrial economy, resources are taken from the environment, processed, transformed into products, distributed, and eventually disposed of as waste. For much of the 19th and 20th centuries, the cost of resources decreased in real terms, leading to little incentive for conservation efforts. However, since the turn of the 21st century, the trend has reversed, with materials and energy becoming more expensive, compounded by the pressure from rapidly growing economies.

Sustainable economies require equitable production and consumption patterns. As competition between industries intensifies, a practical approach is needed to optimise

production costs while improving quality and reducing lead times. Recently, companies have focused on developing practical strategies to improve performance, accuracy, reliability, decision-making, control, and flexibility. In addition, it has become apparent that the manufacturing sector is increasingly incorporating closed-loop resource use into its supply chains, enabling sustainable operations management (Belhadi et al., 2022).

The CE is a sustainable business model that aims to reduce waste and promote reuse and recycling. It contrasts with the traditional Linear Economy model, characterized by a Take, Make, Use, and Throw-away system. Designing out waste and pollution, keeping products and materials in use, and restoring natural systems are the core principles of a CE. By extending products' life cycle, CE can reduce waste, energy, and water consumption. The transition from a linear to a CE is essential for the smarter use of resources and for achieving long-term resilience, economic and commercial opportunities, and social and environmental benefits. It is a business model that aims at sustainability achieved through restorative objects and design (Rosa et al., 2020).

Several authors have contributed to the development of the CE. Definitions describe it as a model inspired by nature, transforming economic practices through product and system innovation. CE is developed based on sustainability coupled with the goal of extending the life cycle of products, thus reducing waste of materials, as well as reducing energy and water consumption. Through this upcoming stage of the economy, it will be possible to achieve systemic change to build long-term resilience, create commercial and economic opportunities and deliver social and environmental benefits through technical and biological cycles (Kusumo et al., 2022). Furthermore, the CE fosters new relationships between companies, which establish symbiotic relationships with each other through the reincorporation of materials into the production cycle. In addition, it will be possible to focus on decreasing waste (Velenturf and Purnell, 2017), postponing cradle-to-grave material flows, organising strategies to enable self-sustaining and 'environmentally friendly' manufacturing decisions, and that resources are recycled to the maximum extent possible (Kusumo et al., 2022).

The CE is based on three principles: design out waste & pollution, keep products & materials in use, and regenerate natural systems. Walter R. Stahel proposed that a CE would turn goods at the end of their service life into resources for others. This would minimize waste and close loops in industrial ecosystems. Recovering value from tangible goods through a tighter closed loop of reuse and restoration could increase economic and environmental performance for recycling and energy recovery (Ashby, 2018). The European Commission defines the CE as a model of production and consumption which involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products for as long as possible. However, it is critical to understand the principles that facilitate this model, which, in the case of CE, involves mastering the principle of the 10 R's. The 10 R's refer to ten activities that promote circularity, including redesign, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, recover, and refuse (Afum et al., 2022). By applying these principles, CE can achieve its goal of decreasing waste and promoting sustainability.

- *Circular Economy, Sustainability, and Innovation in the Footwear Industry*

CE principles are primarily responsible for maintaining materials within the production cycle for longer and reducing raw materials consumption through recycled materials (Ellen MacArthur Foundation, 2017). Furthermore, this is where a new concept emerges with enormous importance, Reverse Logistics. However, due to the complexity of reviewing existing organisational processes and reorganising associated logistics and production processes, reverse logistics is a significant challenge for most companies (Rosa et al, 2020). Therefore, it is worth highlighting the difficulties in implementing the

reverse logistics process in the FWi, which should take into account the structuring of the collection network of products that are in the post-consumption phase, as well as the design of the operational processes, the manufacturing destined to receive and disassemble the products and separate the inputs according to their potential for recycling, reuse and repurposing (Muthu and Li 2021). In addition to the technical challenges of reverse logistics, organizations engaged in feasibility studies point to economic constraints, such as significant investment and maintenance costs (Rensburg et al., 2020).

FW production contributes significantly to the industry's environmental impact, which is one of the most polluting sectors. In 2017, global FW production reached a staggering 23.5 billion pairs, representing a 15% increase over the last four years, according to the World Footwear Yearbook (APICCAPS, 2021). FW is traditionally manufactured using synthetic rubbers, genetically modified cotton, chromium-tanned leather, and chemical adhesives. Sadly, the production process besides consuming large amounts of water and energy, generates harmful toxins that can negatively affect both humans and ecosystems, and emits greenhouse gases.

According to Climate Works Foundation (2022), a non-profit organization, the global apparel, and FW sector is responsible for CO_2 emissions equivalent to those of the EU. According to the Quantis report (2018), the fashion industry contributes 8% of global greenhouse gas emissions, which is almost all the EU's climate impact. The FWi alone contributes 1.4% of global greenhouse gas emissions, or 700 million tonnes of CO_2 eq, with over 60% coming from raw materials extraction (Fig. 1).

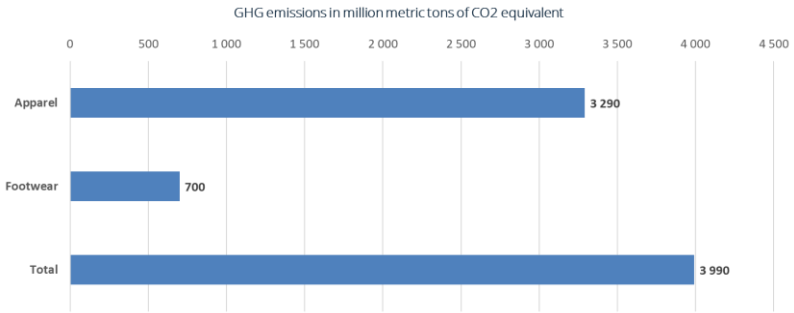


Figure 1 – Greenhouse gas emissions from the apparel and FWi worldwide in 2018 (in million metric tons of carbon dioxide equivalent) (source: Quantis, 2018)

Public awareness of fashion social issues has increased and academic research on sustainable FW value creation focuses on production's environmental impacts. Thus, solutions are proposed to increase the environmental performance of FW products and improve their circularity. Strategies are also proposed to increase the environmental performance of FW products and improve the circularity of the FW value chain.

- *Portugal's Footwear Industry: one step distance to sustainability*

The FWi is fiercely competitive at both national and international levels. Portuguese FW is one of the most prominent in Europe and is renowned for its quality and design. According to the Portuguese Association of Manufacturers of Footwear, Components and Leather Goods (APICCAPS, 2021), the industry employs around 47,000 people and has an annual turnover of around €2.4 billion. Aveiro and Porto are the two regions where most of the industry is concentrated (Vaz, 2023).

Against a backdrop of increased competition due to the entry and establishment of emerging economies on the global market, the Portuguese industry has moved away from market segments where competition is mainly based on price and has shifted towards the production of higher quality FW, focusing on fashion and design, and investing heavily in innovation (Diniz & Duarte, 2015) and international promotion to achieve greater

brand recognition (Gomes et al., 2020). In this context, the FWi has taken several measures, such as redesigning its operational management processes. It also produces small batches and responds quickly and flexibly to customer orders. As a result of its quality production, it can now offer a range of business models, whether launching its brands, "shoes made in Portugal", a symbolic value and guarantee for the product, or producing shoes for international brands of global significance.

About 95% of the Portuguese FWi production is exported to countries such as France, Germany, Spain, and the United Kingdom (APICCAPS, 2021; Gomes et al., 2020). This has enabled the industry to become a major player in the global FW market with a strong brand for quality and design. Thus, the FWi is now a major contributor to Portugal's economy (Batista et al., 2017). Despite its low prices a few years ago, Portuguese FW is now regarded as one of the most thriving industries due to its quality, comfort, design, and efficiency of production and delivery (Ribeiro et al, 2021).

Following the European and global trend, Portugal's FWi has increasingly focused on society's environmental concerns and interests over the last two decades. It has begun to recognize the need for sustainable development practices. As for the environment in this sector, emissions into the atmosphere, solvent consumption, water and liquid effluent management, solid waste, environmental noise, and the use of green materials are the main issues. In terms of business context, Portuguese FW companies are already developing sustainable products and processes and offering more environmentally friendly options to customers (Gomes et al., 2020). It is a sensible option not only because it creates a more sustainable environmental alternative but also because it promotes green marketing, which seems to attract consumers willing to pay more. Because "ecological" shoes are innovative and eco-friendly, they appeal to a wide audience, even though they are sometimes more expensive. Environmental issues such as sustainability and reducing their negative environmental impact are becoming increasingly important to companies. Apart from playing a more responsible and transparent role in society and the environment, companies opt for these types of eco-friendly strategies because of the benefits it brings to their business. Some Portuguese brand companies such as *Zouri*[1], *Re-Coffee*[2], *Marita Moreno*[3] and *AsPortuguesas*[4] have recognised the importance of sustainability and used it as a profitable business prospect. These environmentally conscious companies emphasise improving environmental and social standards while gaining a competitive advantage and optimising value for their stakeholders. By using unconventional materials and adopting alternative business models, they improve their social and environmental impact. Therefore, these eco-friendly companies create constructive change while growing as a business.

An eco-friendlier positioning on the market can be a source of competitiveness and differentiation from competitors, especially in a highly competitive sector such as FW. Portugal exports most of its FW production (APICCAPS, 2021), so implementing green strategies and disclose them to the consumers is a valuable tool to increase sales in new markets. Some of this may be caused by people in other parts of the world being more aware of environmental issues and willing to incorporate those concerns into their purchasing behaviour by buying greener products, which are usually more expensive (Skackauskiene & Vilkaite-Vaitone, 2023).

Conceptual Framework and Design Approach

The present research conceptual framework (Figure 2) comprises (i) the drivers and

[1] https://www.zouri-shoes.com/
[2] https://www.juponline.pt/sociedade/artigo/37174/re-coffee-da-chavena-calcado.aspx
[3] https://maritamoreno.com/
[4] https://asportuguesas.shoes/

barriers related to CE principles application in the FWi and related stakeholders, and (ii) CE business models and practices in FWi production and supply chain, that could be improved, adopting circularity practices focused on reverse logistics. Therefore, it is hoped that this framework allows companies to understand the best strategy to perform a sustainable business model by choosing the type of sustainable innovation and performance-brought-by-the-CE-and-the-stage-in-which-it-should-occur.

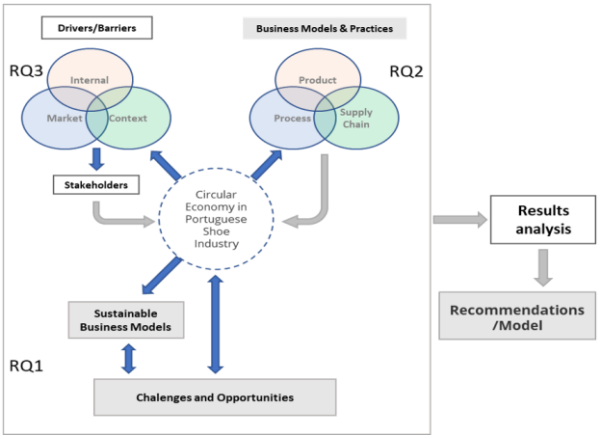


Figure 2 - Conceptual framework to address the impact of CE in FWi business models.

This study examines sustainability practices in the Portuguese FWi through a qualitative research approach. The purpose of the study is to explore how Portuguese FW companies establish and promote sustainability principles. The research uses a purpose-based sampling strategy, following Yin (2014), and involves semi-structured, open-ended interviews with FW companies' managers. The interview protocol is based on sustainable business management literature and the reporting framework G4 of the Global Reporting Initiative (GRI, 2022). The data obtained is mostly text-based and is indexed based on interpretative and reflexive reading, according to Mason (2012).

Regarding the number of companies to be interviewed, we have decided to follow the recommendations of Guest et al. (2006). These authors state that at least 12 interviews are necessary to reach information saturation, but after the sixth interview, it is possible to find concordant thematic lines. Therefore, we conducted interviews until the point where the collected information did not provide new insights or themes, which is known as thematic exhaustion (Guest et al., 2006; Saunders et al., 2019). We reached information saturation with 14 interviews. However, we approached a total of 75 FW companies by email, and only 29 accepted to talk through video conference. The search for new companies to interview was stopped only when thematic saturation was achieved. The Table 1 shows some data on the companies (all in FW production) obtained during the introductory phase of the 14 interviews.

Table 1 – Data from the interviewed FW companies

Company	# of employees	Pairs produced (daily)	Own brand	Registered models	Subcontracting parts of production
1	160	1200	Y	Y	Y (sewing)
2	51	600	Y	N	Y (sewing)
3	100	900	N	N	Y
4	23	150	Y	N	Y
5	75	600	Y	Y	Y (sewing)
6	16	60	Y	N	N
7	170	2500	Y	Y	Y
8	108	2500	N	Y (soles)	Y
9	52	800	N	N	Y
10	10	100	Y	Y	Y
11	105	900	Y	Y	Y
12	320	5000	Y	N	Y
13	104	2000	Y	N	Y
14	40	400	N	N	Y (cutting and sewing)

The data was not treated as variables but as unfinished resources or products, as this will support a broader range of analytical and explanatory logic. The study focuses on drivers and barriers to CE principles, innovations, customer and environmental value propositions, value capture/creation mechanisms, CE objectives, KPIs, descriptions of digital technologies, and climate/social/environmental strategies.

Findings and Discussion

To briefly describe the Portuguese FW companies, two databases with information about Portuguese FW manufacturing sector, Amadeus and APICAPPS data, were analysed. Merging results reveals that before the pandemic, there were 1290 Portuguese FW companies, and the number grew to 1704 when the tanning, components, and leather goods subsectors were included. After two years of pandemics, the industry has 1546 companies, 1159 producing FW. As shown in the Table 2, large companies make up only 0.7% of those and over 80% of the database belongs to micro/small businesses.

Table 2 – Frequencies of Operating Revenue and Employees Number of FW companies in Portugal

		Percent	Number of Employees				Operating revenue (th €)			
Size of the Company	Frequency	(%)	Mean	SD	Max	Min	Mean	SD	Max	Min
Micro	514	44.4	4.7	2.8	10	1	377.6	435.5	1982.9	0
Small	464	40.0	24.5	10.8	50	11	4574.4	2084.6	9682.3	2017.9
Medium	172	14.9	91.1	36.4	238	51	18452.4	8459.6	44193.8	10202.9
Large	9	0.7	629.2	429.6	1495	268	104235.2	4688.7	107550.6	100919.9

The industry environment of FW is quite dynamic and complex, as is typical in the fashion world. Unfortunately, the limited resources of SMEs limit their ability to respond to changes in the environment (Alam et al., 2022).

However, the Portuguese FWi benefits from the existence of associative and technological structures, especially APICCAPS, that provide important support, which is responsible for most of the mobilisation actions for the FWi. They play a crucial role in developing collective strategies that promote networking and cooperation to overcome the difficulties posed by the small size of most companies. The strategic objectives of these entities are to promote the competitiveness of companies and the FW sector image, to modernise companies, to promote R&D and the development of new technologies, to qualify and train human resources and to contribute to strengthening links between industry, universities, and research institutes (WFW, 2023).

This study was guided by three research questions and the outcomes are, as follows:

- *[RQ1] What is the level of CE knowledge in the FW sector that enables companies to become more sustainable and reduce its environmental footprint?*

During the initial phase of the interview, the focus was on evaluating the respondents' familiarity with the concept of CE and their level of involvement with it. Lack of awareness was identified as a significant cultural barrier that could hinder companies from implementing CE practices. Although all interviewees had a general understanding of the concept, they did not always refer to it as CE specifically. Rather, some used terms such as "sustainability" or "environmental cycle" instead. To successfully implement CE, it is crucial to embed the concept in the company's culture, as de Jesus & Mendonca (2018) stated. This involves representing CE in the organization's mission, strategy, and guiding principles, as quoted by three of the interviewees: "This practice has been part of our culture for a long time, and it is part of what makes us unique" (#4), and "We stand behind it as part of our culture" (#3). In line with this, interviewees highlighted the integration of CE into their company's values, with some stating that it is part of their culture and something they have been practicing for a long time “Creativity, novelty, and adaptation are part of the secret of the FW sector in Portugal, and the CE opportunity gives us that guarantee” (#6).

Most of the interviewees were also aware of the European Commission's proposal to promote CE, with some already engaged in related projects (Companies from interviewees #4 and #10). However, two respondents were not familiar with the proposal (#9 and #14). Additionally, all the interviewed companies were certified according to ISO 9001 and ISO 14001, which are environmental management systems that promote sustainable practices (ISO, 2015). Respondents said each company was interested in further exploring the CE concept. There was a strong recognition of the importance of the concept in developing the sector. "We think this concept is the future and should be present in every company" (#2 and # 6). Public opinion is cited by (#7) "Consumer demand for sustainable products, ethically sourced and good for the environment has become fundamental to our company's change". This aligns with recent research (Ciasullo et al., 2017; Gomes Oliveira, 2022; Hur, 2019).

- *[RQ2] Which fundamental sectors in the FWi should foster greater circularity, reuse, and recycling to accelerate rather than stall development?*

According to the interviewees, focusing on circular design principles, common sustainability standards and investment in the technology sector can help the FWi move towards more sustainable practices and reduce waste. The experts interviewed support the idea of a digital product passport that includes information on circularity and environmental aspects, working conditions, and repair and reuse options. #1 suggests setting minimum requirements for FW products to improve the overall environmental performance throughout the product's life cycle. Respondents #3, #6 and #13 welcome the aspects of a strategy on more explicit information on the circularity of the FW sector and, again, on a Digital Product Passport based on mandatory information requirements on circularity and other environmental aspects. This Digital Product Passport should be available to all stakeholders and consumers and include information on working conditions and the repair and reuse of products. Respondent #7 refer “blockchain has the potential to become the single source of truthfulness for the FWi and provide transparency across the supply chain”. This answer follows Guo (2023) results.

According to the analysis of the interviews regarding RQ2, the selected sectors referred by the interviewees that could benefit most from these practices include:

Design and Material Selection: The design and material selection phase are critical to foster greater circularity in the FWi, from shoes to packaging. This perception was also referred in Jestratijevic et al (2022) and Kasiur et al. (2022) work. Designers can incorporate circular principles into their design process by creating modular designs that allow for easy repair, disassembly, and material recovery. Material selection is also crucial in promoting circularity by using sustainable and renewable materials that can be recycled or biodegraded at the end of their useful life.

Manufacturing: Manufacturers can implement circular practices in their production processes by adopting closed-loop systems that minimise waste and pollution. By using recycled materials and reducing energy consumption, manufacturers can create sustainable production processes that reduce the environmental impact of the FWi.

Distribution and Retail: The FWi can also promote circularity in distribution and retail by reducing waste and optimising logistics. Implementing circular principles such as reverse logistics, leasing or rental programmes and repair services can extend the lifespan of FW and reduce waste. This aligns with Dragomir and Dumitru work (2022).

End-of-Life Management: Finally, end-of-life management is critical to accelerating sustainable development in the FWi. Recycling and repurposing old FW can produce new materials, reduce waste, and promote a circular economy. This could include establishing take-back programmes, developing infrastructure for recycling, or composting and promoting awareness of proper disposal and recycling methods.

- [RQ3] What are the barriers and drivers to material circularity in the FWi? In what ways can circularity be improved?

A sustainable FW sector requires sustainable patterns of production and consumption that treat all parts of the economy equitably. As competition between companies in the sector increases, a practical approach to optimizing production costs while improving quality, innovation, and reducing lead times is needed. In recent years, organizations have given much attention to designing practical strategies to increase performance, accuracy, reliability, decision-making, control, and flexibility. Furthermore, it has been shown that the FWi is starting to include a closed cycle of resource utilization to support decisions that are most suitable for achieving circularity across supply chain.

The interviews aimed to evaluate the relationships between applied CE strategies and their consequences for innovation (technological and non-technological) and for companies' performance (financial and non-financial). To achieve sustainable performance, FW companies need to adopt sustainable patterns of production and resource consumption that are equitable across the entire supply chain. This means that companies must prioritize efficiency and quality while also reducing waste and negative environmental impacts. As competition in the FWi increases at a national and international level, companies must find ways to optimize production costs while still meeting high standards for performance and quality. This requires a new design, not only for the fashionability of products but also for practical strategies that improve decision-making, control, flexibility, and circularity.

One way to achieve sustainable operations management is by adopting a closed cycle of resource utilization in the supply chain. This means that materials and resources are reused and recycled whenever possible, minimizing waste, and reducing the need for new resources. By incorporating a CE perspective into their operations management, companies can help support a more sustainable economy while also benefiting their bottom line.

Figure 3 summarizes the initiatives, obstacles, and drivers mentioned in the 14 interviews, as well as the actions that bring managers closer to or away from CE practices in the FW sector. Each initiative, barrier, and driver analysed is shown in the figure and identified by numbers according to the captions. However, it is noted that there is a need for circular initiatives in the distribution phase, as failures have been reported in the logistics sector of FW, as this sector generates significant carbon emissions that could be reduced, for example, through more efficient routes and cleaner means of transport.

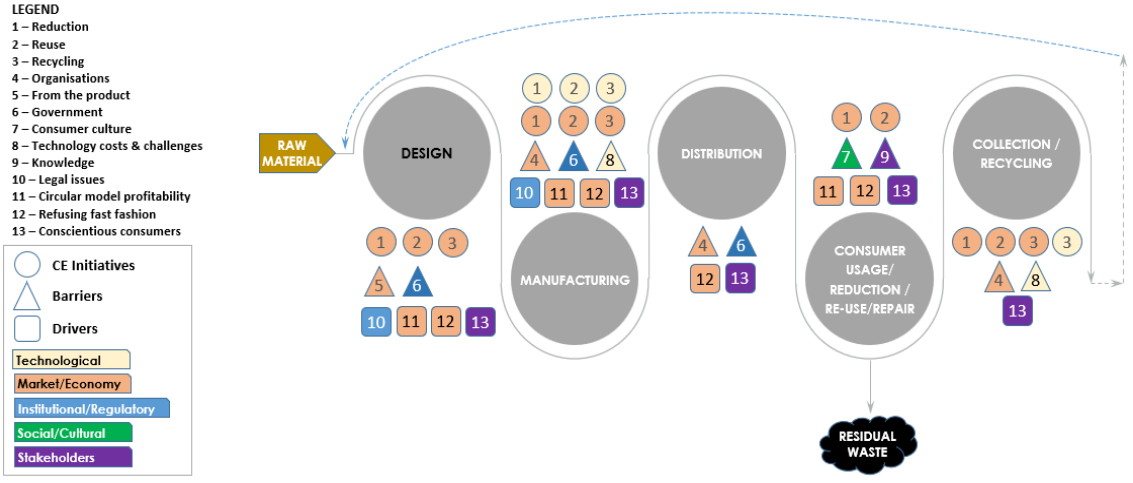


Figure 3 - Initiatives, barriers, and drivers of CE applied to various stages in the Portuguese FWi

Final Remarks

New competing products could change market bases, requiring companies to explore new ways of gaining a competitive advantage. By combining knowledge with technological advancements, companies can develop enhanced capabilities and innovative products that put them ahead of their competitors (Trott, 2017). Businesses must align with sustainable standards and ensure environmental preservation, and gaining traction becomes even more critical (Ahmad et al., 2020; Huang & Li, 2017). A company's survival and economic progress depend on innovation.

The Portuguese FW industry is not averse to innovation activities or emerging technologies (Cardoso & Torkkeli, 2014; Gomes et al., 2020). Although the FW companies surveyed do not have research and development (R&D) departments, innovation is still an essential part of their operations, and it is even considered a reason for their growth. Innovation plays a crucial role in the Portuguese FW sector by developing and optimizing products and processes, whether for its international projection or its ability to attract major fashion powers. However, the sector prefers incremental innovation as radical developments are seen as expensive and risky. FW companies believe incremental innovations are better for sustainable growth, unlike Büschgens et al. (2013) and Oke (2007), who argue that radical innovations are better for new markets and growth.

The Portuguese footwear industry follows an open innovation model (Chesbrough, 2012, 2017). It highlights several efforts by companies and suppliers to make footwear from sustainable materials and improve production processes. The sector's success and progress can be attributed to its ability to innovate collectively and form regional knowledge and experience clusters that quickly transfer to other companies (APICCAP, 2021; Della Peruta et al., 2018; Vale & Caldeira, 2007, 2008). However, involving universities (Rauter et al., 2019) and users (Ziemba et al., 2022) in the innovation processes could increase the sector's innovation capacity. Although only a few footwear companies are doing it, the FWi is starting to include a closed cycle of resource utilization to achieve circularity across the supply chain.

Sustainability plays a crucial role in the Portuguese footwear industry's operations and future (Rizos et al., 2016). Consumers' demand for "green" products (Mehta & Cahal, 2021; Kumar et al., 2021) is also a significant factor for footwear companies, though, in some cases, it is indirectly imposed by foreign brands. Therefore, the industry must continue to adopt an environmentally friendly stance and increase its sustainability parameters, not only to be competitive but also to reduce costs and material waste collectively (Calza et al., 2017; Jia et al., 2023).

The outlook for eco-innovation is not so positive. The footwear companies surveyed only showed a moderate inclination towards eco-innovation. However, two interviewees have mentioned that their company is making a difference in the FW sector by using 100% recyclable/recycled materials and adopting environmental technologies, falling within the scope of eco-innovation (Schiederig et al., 2012; Wang et al., 2020). Given that "green" innovations lead to various commercial and productive benefits (Calza et al., 2017; Huang & Li, 2017; Jia et al., 2021; Wang & Xue, 2019), the Portuguese footwear industry needs to find tools and solutions that stimulate green creativity within its business fabric. To do so, the industry could work to raise awareness among its stakeholders about the benefits of green development and even provide training, establishing a partnership with universities and R&D centers.

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The references might be found here: https://30th-euroma-conference---leuven-2023.webnode.pt/