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Sustainability in Business Plans: a Portuguese Linen Textile Company case

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Abstract. This article examines sustainability in the Textile Industry (TI) using Elkington's Triple Bottom Line (TBL) framework, emphasising People, Planet and Profit. The literature review examines the TBL pillars and emerging solutions to minimise environmental impacts in textile production. While circular economy (CE) practices alone are not enough to combat pollution and the effects of climate change, a second solution mentioned in the Literature Review is using natural fibres in the textile industry. These natural fibres offer a double advantage in TI: (i) sustainability benefits and (ii) a cleaner and greener industry. The EU Strategy for Sustainable and Circular Textiles underlines the importance of such initiatives and positions natural fibres as environmentally superior. This paper outlines a dual approach focusing on the linen sector as a case study. It concludes with a call for sustainable practices in the linen TI and presents an innovative business plan guided by the CE principles..

Keywords: Business Planning; Linen Fashion; Circular Economy; Sustainability; Textile Industry.

1. Global Dynamics: Balancing Welfare, Competitiveness, and Sustainability in Apparel Mass Customization

Around 1960, the emergence of fast fashion brands revolutionised the fashion industry by introducing a business model focused on providing consumers with fashionable clothing at affordable prices (Ellen MacArthur Foundation, 2021; Piippo et al., 2022). This approach relies heavily on mass production to reduce the cost of the final product and improve competitiveness. However, the drive to provide low-cost yet fashionable clothing has encouraged widespread "buy and throw away" consumer behaviour, contributing to textile waste. On average, consumers in the European Union (EU) throw away 11kg of textiles each year, highlighting the unsustainable nature of this consumption model (European Parliament, 2023). A closer look at the textile industry reveals a sizable consumption of resources/energy in all stages of fashion production (Peters et al., 2021). E.g, yarn production and the wet treatment processes (bleaching and dyeing) are energy-intensive phases, which account for a significant proportion of the total energy requirement. So, to overcome these challenges, a paradigm shift towards sustainability is inevitable. This requires rediscovering production and consumption patterns in the fashion industry, moving away from mass production and minimising the impact on the supply chain.

2. Threads of Concern: Sustainable Dilemmas in Textile and Apparel

2.1. Environmental impact

When identifying the most polluting industries, it is essential to consider the five primary forms of pollution: water, air, soil, light, and noise. Research studies, by Piippo et al. (2022), show that the fashion industry is the third most polluting sector worldwide after the oil industry and agriculture. It is well known that natural fibre production, particularly cotton, is characterised by significant environmental impact. In terms of soil pollution, the extensive use of fertilisers and pesticides during harvesting harms soil quality and

biodiversity, and the estimated annual consumption of 70 billion litres for garment production contributes to 20% of industrial water pollution from the treatment and dyeing of textiles. According to reports, 7,000 to 29,000 litres of water are required to produce 1kg of cotton, with over 87% of total water consumption used in manufacturing (Sandin et al., 2019). Thus, producing a single T-shirt requires 2,700 litres of water, equivalent to one person's drinking water needs for two years (European Parliament, 2023).

Textile industry is characterised by chemical-intensive processes, with around 15,000 chemicals used in manufacturing processes (Roos, et al., 2019). Thus, hazardous substances from textile production are often disposed of in waterways, affecting rivers and oceans and posing health risks (EEA, 2019). The production of clothing uses about 1,900 chemicals (EEA, 2019) and in the finishing and dyeing steps of product manufacturing, and this is responsible for around 20% of global clean water pollution (European Parliament, 2023).

Another major problem is air pollution caused by emissions from oil machines and diesel generators during production. This issue occurs mainly in the pre-consumption phase (Niinimäki, et al., 2020), especially in production countries such as China, which accounts for a large proportion of global energy consumption in the textile industry (Eutotex, 2020). Textile production is a significant CO_2 emitter, emitting 4-5 billion tonnes annually (Niinimäki, et al., 2020). In 2017, the purchase of clothing, footwear, and household textiles in the EU generated emissions of 654 kg CO2 equivalent per person (EEA,2019), making the fashion industry responsible for 10% of global carbon emissions, surpassing international flights and maritime shipping combined (European Parliament, 2023). The European Union (EU) produces 12.6 million tons of textile waste every year (EU, 2023), with apparel and footwear accounting for 5.2 million tons of waste alone, which is about 12 kg of waste per person every year (EU, 2023). Only 22% of post-consumer textile waste is collected for reuse or recycling separately, while the others are often incinerated or landfilled (EU, 2023).

Within the EU, the upstream value chain (apparel, footwear, and home textiles) is a major consumer of raw materials and ranks fourth (EEA, 2019). This shows a significant demand for resources in the initial stages of production, reflecting the extensive use of materials and inputs before the final products reach consumers. The importance of this value chain for raw material consumption emphasises its impact on resource availability and environmental sustainability. As the EU endeavours to address environmental concerns and improve resource efficiency, it is essential to identify and manage consumption patterns within this value chain.

2.2. Socio-Economic impact

The textile industry has a significant and complex socioeconomic impact since many people depend on it for a livelihood, especially in developing countries (Piippo et al., 2022). Besides creating jobs, the industry generates income and improves the financial well-being of workers and their families. Moreover, the apparel sector contributes to skills development by providing training and expertise on various aspects of the production process. Skills improvement is valuable for human capital development (Niinimaki et al., 2020). Through its production and trade activities, the industry also contributes to overall economic growth by boosting GDP and positively influencing trade balances (European Parliament, 2023).

The global supply chain complexity highlights the different regions linkage, from raw material suppliers to manufacturers, demonstrating the industry's impact on a broader socio-economic level. The apparel sector encourages entrepreneurship, with many small businesses involved in manufacturing, design, and retail (Neto et al., 2021) stressing its role in supporting a diverse and dynamic business ecosystem, contributing to economic vitality.

The apparel industry is critical in making clothing accessible and affordable to many consumers. This emphasis on consumer access and affordability underscores its positive impact on individuals' quality of life and standard of living (Piippo et al., 2022). However, alongside these positive contributions, it is crucial to recognise and address the industry's challenges. Labour practices are a significant cause for concern, and there are reports of poor working conditions, low wages, and problems with labour rights in certain regions (ILO,2019).

As highlighted by the International Labour Organisation (ILO) in 2019, exploitation labour practices contribute to socio-economic inequalities and adversely affect workers' well-being. Simultaneously, the

industry's emphasis on fast fashion and mass production, as identified by Niinimäki et al. (2020), is linked to environmental degradation and resource depletion. This environmental harm, in turn, has far-reaching consequences, including negatively affecting local ecosystems and further influencing the socio-economic conditions of the communities surrounding these industries. Therefore, a systemic connection exists between exploitative labour practices, the fast fashion industry's production methods, and the resulting impacts on human well-being and the environment. Furthermore, the global nature of the apparel supply chain sometimes leads to a race to the bottom, where companies strive for the lowest production costs, potentially exploiting workers, and communities. This race to the bottom can drive social inequalities and economic imbalances.

After consumption, textile waste are a challenge due to environmental pollution. In some regions without proper textile waste management regulations, local communities can be negatively affected, and external factors, including fast-fashion models adopted by multinationals, contribute to environmental challenges (Ellen MacArthur Foundation, 2021). With low prices and short clothes life cycles, fast-fashion companies can make significant profits without investing in reverse logistics or recycling. Textile waste is linked to external factors shaping the industry, adversely affecting workers, communities, and the environment. In the fast fashion industry, women comprise 60.5% of the workforce and are particularly vulnerable because of low wages and inadequate recognition (ILO, 2019). On the other hand, slow fashion emphasizes quality and durability. Using materials and clothing for extended periods aligns with CE concepts. As a result of these sustainable practices, environmental action and social change are accelerated in the textile industries (Matušovičová, 2021).

2.3. Circular Economy in the Textile and Apparel Industry

CE addresses environmental challenges associated with linear economies by prioritising unlimited production and neglecting social and economic impacts within supply chains (Agyemang et al., 2019). The CE aims to transform economics by advocating reuse, recycling, and reduction (Stahel, 2019). CE adopts a circular approach that extends the benefits of materials and clothing rather than the linear approach that involves resource extraction and waste. Within the circular framework, "reducing" means a concerted effort to decrease inputs and outputs, promoting eco-efficiency (Rahla et al., 2021). Using "Reusing" involves repairing and refurbishing clothing and materials to extend their lifecycle (Rahla et al., 2021). In reality, recycling clothing faces barriers, including technological complexity and financial constraints, resulting in minimal recycling rates worldwide (World Bank, 2015). Therefore, the fashion market is seeing rapid growth in "reuse" segments, which can reduce raw material consumption, conserve resources, and reduce the environmental footprint (ThredUp, 2019). In CE, circular design emphasizes sustainable and durable materials in product development (Dan & Ostergaat, 2021). CE designers can use fabric-cutting techniques, 3D prototyping software, and innovative garment manufacturing processes. Nevertheless, designers' transformative potential is constrained by limited access to sustainable materials (Dan & Ostergaat, 2021). CE creates "regenerative or restorative design" (Ellen MacArthur Foundation, 2021). This includes careful material design, closed-loop systems, and resource efficiency, all of which emphasise the importance of product design in achieving CE (Murray & Skene, 2017). By challenging the linear cycle of production, consumption and disposal, CE becomes a key strategy to reduce textile waste, minimise the global carbon and water footprint and address resource scarcity (Chen, 2021).

3. Problem to address and a Business Plan to achieve solutions

Fashion and textile industries are notorious for their environmental impact and social responsibilities. Clothing's ever-growing demand for high-quality materials worsens environmental impact, and financial pressure often neglects environmental protection measures. However, as public, and political pressure increases, these industries become more sustainable despite historical adherence to capitalist growth paradigms (Andersen, 2017). As demonstrated in extensive literature and research, organisational change is a considerable challenge. As a result, sustainability offers a compelling alternative to business models that harm the environment and perpetuate social injustice. This work proposes a sustainable business plan for the natural fibre textile sector. As one of the most sustainable fibres, linen is selected as an example of a primary raw material. Ecological concerns and consumer trends drive increasing demand for natural fibres like hemp and linen for textiles. It takes five times fewer pesticides and fertilizers to grow linen, and most

of the world's linen, valued for its long fibre, is grown in Europe. This natural fibre targets the upper-middle market with luxury clothing as its goal. A buoyant economy and a sustainable strategy are crucial to the linen textile industry's future.

A business plan is a fundamental tool that helps managers understand the current state of the business (by identifying strengths, weaknesses, opportunities, and threats) and provides insight into the future. This plan is crucial for efficient management, attracting new customers and partners and securing credit. Fiore, F. (2005) states a business plan fulfils two main functions. Firstly, it is an organisational tool to streamline and clarify the company's goals and strategies. Secondly, it acts as a sales document, effectively presenting a business idea and demonstrating that a product or service can generate profits, attract funding and secure business resources. The present business plan elaborates on creating a sustainable linen company that is competitive in the Portuguese textile industry and meets the needs of Portuguese customers and consumers. Therefore, this plan should serve as a guide for implementation practice and a guiding line for decision-making, defining the company's objectives and planning needs. Nevertheless, several considerations must be addressed before developing and implementing the business plan. Key questions include: "What is the current state of the linen manufacturing market in Portugal, and how does it operate?" "What are the production costs associated with linen clothing products?" and "Is there a growing interest among designers to work with 100% linen fibre?"

3.1. Methodological approach

The methodology used to create the business plan requires extensive research and analysis. First, secondary data gathered from external sources were widely used, such as literature reviews, company websites and online annual reports, to summon the necessary information on business planning, the linen industry & and market, textile industry, eco-design, sustainability in textiles, CE, and the role of CE in fashion.

Then, a qualitative analysis follows, looking at experts' perspectives on textiles and circular design, specifically focusing on the current state of the linen manufacturing market in Portugal, its operational intricacies, and the production costs of linen garments. In addition, an evaluation was conducted on designers' enthusiasm to engage with 100% linen fibres. Considering gender, age, educational background, and position held within the company, Table 1 presents the profiles of respondents from each organisation.

Table 1: Respondents' Characterization (hereafter, all interviewees will be referred to by the designations in brackets)

Participant	Gender	Age	Academic Education	Role in the sector
Interview 1 (i1)	Female	40	PhD in Design	Designer Professor at Univ. Minho
Interview 2 (i2)	Male	61	MSc in Management	WIN-WIN Textile CEO
Interview 3 (i3)	Male	38	Degree in Engineering	POLOPIQUE Spinning Production Responsible
Interview 4 (i4)	Male	58	MSc in Textile Engineering	FITECOM S.A. CEO

The interviews are a vital step to understanding the market landscape, assessing the feasibility/viability of the business idea, and identifying potential customers. The primary techniques for analysing interviews included qualitative analysis. The environmental analysis is conducted through a Political, Economic, Social, Technological, Environment, and Legal (PESTEL) analysis, which aims to uncover the external forces affecting the business. A comprehensive investigation is carried out for the internal audit, including a functional analysis, an assessment of competencies, capacities, and resources, and a SWOT analysis. A Business Model CANVAS is also created to formulate a strategic plan that outlines the company's value proposition.

This sustainable business plan should focus on four factors. First, to know how the Portuguese textile market works and how linen is manufactured. Next, examine the production costs associated with linen garment products, considering the different stages of the manufacturing process. Understanding the price range of retail chains looking for 100% linen products is crucial. Several factors must be considered, including production costs and market demand. Finally, it is crucial to determine if designers actively seek 100% linen in their creations. Completing the comprehensive approach is understanding potential market demand and preferences.

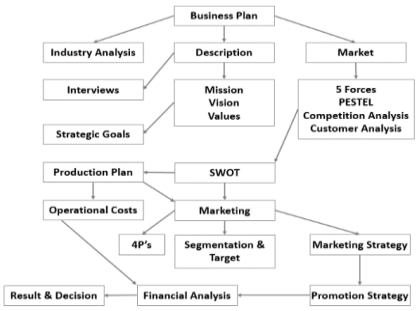

Fig.1. Framework for the analyses applied in executing this New Linen Factory Sustainability Plan

By carefully considering these factors, the sustainable business plan should point to an environmentally conscious and socially responsible future in the textile and fashion industry and identify how the company can provide a competitive advantage to its potential customers. Figure 1 shows the structure of the analyses used to implement this Business Plan.

4. Main Findings and Results' Discussion

This section examines the market landscape and the textile industry dynamics. The analysis includes an Industry Analysis covering the Global and European textile market, the Portuguese textile market, its sustainability, and the linen market. The section also covers a SWOT analysis, which provides an internal assessment. Finally, it presents the results of "Porter's five forces", which shed light on market competitive forces.

4.1. Industry Analysis

4.1.1. Global and European Textile Market

The textile industry processes natural and synthetic fibres into yarns and fabrics used to manufacture various goods, such as high-tech synthetic yarns, bed sheets, industrial fibres, and clothing. In a global context, the United States emerges as the frontrunner in revenue generation within the Apparel market.

Around 599,009 people work in the textile industry in Europe, generating 88 billion euros in revenue. EURATEX (2020) shows that 99.8% of businesses in the textile and clothing industry are small and medium-sized (SMEs). Europe's fashion and textile industry comprises approximately 1.5 million companies, with a turnover of €162 billion in 2021. The European Commission says over 70% of the industry's workforce is female. The industry is also highly fragmented, with 98% of companies having less than €2 million in annual revenue. SMEs account for 80% of textile and clothing exports to the EU. Textile production can be categorized into three main sectors: clothing, household, and industry. According to Euratext (2020), Italy is the leader in European investments in textiles, clothing, and synthetic fibres. Germany, France, Portugal, and Poland follow.

4.1.2. Portuguese Textile Industry

Portuguese textiles have a long history and economic significance. The past decade has seen substantial growth despite a crisis in the 1970s and 1980s due to excessive reliance on cheap labour. Innovating, delivering quality, and pursuing sustainable production practices have led to this resurgence. As a result of this shift, the sector is expected to remain competitive in the global market. Portugal is a hub for textile/apparel production, with its textile industry contributing 6% to GDP. According to Banco de Portugal (BPstat,2023) about 121.124 people are employed in the textile sector, making Portugal's 15th most profitable industry. In 2022 the sector comprises 6339 companies, generating a collective turnover of EUR 8.833 billion (BPstat,2023). The Portuguese economy relies heavily on this sector, which employs more than 10% of the workforce. With 65% of its production exported to 189 countries across five continents, the industry plays a crucial role in foreign trade. As a result, Portugal ranks 22nd among clothing exporters worldwide and 10th among EU exporters, with 5.5% of national production exported to the EU. Table 2 provides key indicators of the Portuguese textile industry (Embassy of Denmark, 2020). Furthermore, the Portuguese Textile and Clothing Industry is mainly located in the Portugal North Region which represents 87% of the sector's turnover and 85% of employment (ATP, 20198). The region hosts the most significant number of textile companies in Portugal and has the highest concentration of SMEs. Raw materials

availability, skilled labour, and market access contribute to this. Many textile-related businesses, from designers to manufacturers, are also in the region. Government subsidies and incentives also encourage growth.

4.1.3. Sustainability in the Textile Sector

By combining innovation and sustainability, the Portuguese fashion sector creates products with increased value and contributes to economic sustainability for companies. Portuguese businesses, particularly textile firms, are tackling pollution by aiming to eliminate or reduce its effects (Neto et al., 2021). Interviewee 2 (i2) says this change is "*driven by the resulting economic and environmental advantages, adding to a positive image that enhances its market position*". Sustainable practices have been adopted by many Portuguese textile companies, including wastewater recovery, eco-friendly materials (Provin et al., 2021), synthetic fibres, and social measures during manufacturing (Li et al., 2023), reflecting a high level of environmental awareness, and some companies specialize in recycling textile waste (Costa et al., 2022). The interviewee (i3) highlights that "*the Portuguese textile and clothing cluster has become one of the world's most innovative and modern clusters, with a reputation for cutting-edge technical textiles and private label models*". According to the interviewee (i1), "*most companies in this sector have existed for over 20 years and are mainly micro-enterprises*", in line with the Portuguese PORDATA (2023); however, "i1" emphasizes that "*Portugal is the most trusted fabric/apparel producer worldwide*". In the same line of thought, "i4" mentions that it "*requires us to do business with several brands that demand investment in sustainability areas"*. As a result of working for these companies, the CEO knows "*these investments could increase the company's profit margin and generate more income for the company*".

Regarding environmental impact, respondents agree that pollution from the sector is obvious and needs to be tackled quickly. The "i2" said that "*if we didn't report pollution situations, this could affect the brand's reputation and trustworthiness in a short period; in extreme cases, this trust might even disappear*", and "i1" is peremptory: "T*o prevent the environmental impact, companies should work on and invest in innovation to develop alternative, "greener" and, if possible, reusable products*". Consumers are becoming increasingly concerned about pollution, reflected in their opinions. Organisations and governments worldwide strive to minimise the environmental impact of individual actions, processes, cities, and countries. Consumers pick up on this message, and businesses are responsive to it. By pointing out the significant amount of textile polymers washing ashore in different parts of the world, substantiate and quantify a dilemma attracting global attention. In this context, sustainability is very important in society, and companies are pursuing short-term goals to achieve it. Therefore, some authors (Al-Issa et al., 2022) propose that companies integrate the corporate governance pillar, which shows how business is conducted, with the social and environmental pillars, which show how people and the environment are affected by the company's activities (BOF, 2021). This integration aims to create additional customer value.

According to interviewees, sustainability has become increasingly important, and the perception that customer pressure has made most organisations more committed to sustainability is robust. In the interview, "i2" says, "*In a few years, if a company is not sustainable, it will not be able to operate. The market is evolving in this way, and being sustainable will be a standard thing, with increasingly tighter rules towards sustainability*". Similarly, "i4" says "*Regarding strategy, we would have to choose that way* |sustainability| *because of our clients*". A shift from indifference to active demand has occurred within the textile sector for the implementation and monitoring of the entire value chain. Textile pollution, which the interviewees have cited as one of the most polluting industries ("i1" points to "*A sustainable strategy that ensures the transition from the manufacture of polluting products to recyclable, reusable and/or ecological products*" and "i3" referring "*we are betting on overcoming the problem of pollution, or at least minimizing it*"), is a fact that aligns with what has been stated by various governmental and non-governmental organisations (Hwang et al., 2016; Mulder, 2022).

4.1.4. Linen Market

About 80-85% of the flax used for fibres is grown in Western Europe (France, Belgium, Netherlands) France is the world leader in the production of flax fibre while other important flax fibre-producing countries are Spain, Egypt, Russia, and China (MMR, 2023). In 2020 global flax fibre production was around 1 million tonnes. Linen falls into the 'other plants" category, accounting for only 6.5% of total global plant fibre

production. Synthetic fibres, on the other hand, account for 68.2% of total global fibre production (Debnath, 2021).

Linen has three markets: Home Textiles, Apparel and Industrial. This work focuses on linen in the apparel industry since as a sustainable fibre of high quality, the demand for linen is expected to increase (MMR, 2023). In addition, linen is durable, soft, breathable, and highly absorbing (Chanda et al., 2020). The only drawback is linen's low elasticity, which explains why it creases easily (MMR, 2023). Furthermore, flax fibres are costly to produce as they must be separated from the stalk, which explains the slow market growth and why it is considered a luxury market. The global market for quality linen fibres is expected to grow at a CAGR (Statista, 2023) of 5.1% during the forecast period 2020-2026 (MMR, 2023). Given this overview, the lingerie market still appears to be in the 'launch' life cycle phase as there is still high market growth potential, and demand is also expected to increase gradually over the years. To start a new business, one must look at the external and internal market trends that can influence growth and help managers make the right decisions. A PESTEL analysis focuses the European and Portuguese trends influencing the textile business. Also, the business sustainability plan will include an analysis based on Porter's Five Forces and a SWOT analysis to gain a better understanding and knowledge of the new linen company's key strengths, weaknesses, opportunities, and threats in the national and international context.

4.1.5. PESTEL Analysis

PESTEL analysis is a strategic management tool that uses a structured method to help organisations and new businesses understand and evaluate external macro-environmental factors affecting their business. The acronym PESTEL stands for Political, Economic, Social, Technological, Environmental, and Legal factors. Through this analysis, companies gain a holistic overview of their external environment. This will enable them to capitalise on opportunities and overcome challenges for sustainable success. It enables informed decision-making, minimises risks and maximises opportunities, contributing to the overall success and sustainability of the company.

Political Factors - In 2019 the EU introduced the European Green Pact, aiming for a carbon-neutral economy by 2050. Key goals include a 55% reduction in greenhouse gas emissions by 2030 and addressing pollution and biodiversity concerns. Legislative proposals span various sectors. The upcoming linen business plan aligns strategically with the Green Pact, highlighting linen as a sustainable fibre with flax production contributing to CO2 absorption. Portugal's €16.6 billion Recovery and Resilience Plan (PRR) until 2026 prioritizes Resilience, Climate Transition, and Digital Transition (FiGroup, 2022). With €145 million allocated to Climate Transition, a focus on the bioeconomy involves textile and apparel industries. Emphasis is on integrating forest biomass, investing in natural fabrics, and adopting circular business models. The linen business strategically aligns with the Green Deal, emphasising linen as the world's most sustainable fibre. It should promote societal awareness of conscious production and sustainable consumption, which is crucial for economic resilience (Council of the EU, 2023).

Economic Factors - The European economy has grown 2.3% in 2023 and the variance is attributed to global supply bottlenecks, particularly manufacturing, intensified by a swift post-pandemic demand surge. The Ukraine-Russia war further complicates matters, elevating food, and energy prices, causing regional instability, and triggering widespread social, economic, and humanitarian crises globally, and energy prices have steadily risen since November 2021 (Council of the EU,2023). Portugal had a nominal GDP of 6.3% in 2022 and 2.6% in 2023 (BPstat,2023), anticipating 2% in 2024. Synthetic fabrics are also anticipated to grow (Textile Exchange, 2023) due to a growing global population expected to reach 8.5 billion by 2030. The fashion market should increase from €1.5 billion in 2021 to approximately €2 billion by 2026 (Statista, 2023).

Social Factors - Increased awareness of the effects of climate change among younger generations has fuelled environmental activism in recent years. Climate change pressures companies and governments as customers, investors, and the media demand sustainability. According to a One Pulse survey (2018), 88% of Americans and Brits want environmentally friendly brands. In addition, the second-hand market will grow at a CAGR of 15-20% over the next five years (BCG Consultancy, 2020).

Technological Factors - Textiles are reshaped by advanced methods and technologies. The Inditex Group, for instance, invests in sustainable and eco-friendly programs, including one that measures and reduces

microfibre release during washing. The Innovation Hub reduces its carbon footprint by converting carbon emissions into fibres. This pioneering programme addresses the fashion industry's chemical-intensive nature and improves chemical production quality. Using food waste, algae-based threads, pineapple sleeves, and textile waste, companies like Resortecs (2022) are advancing textile recycling technology.

Environmental Factors - Greenpact (2019) commits to a cleaner future, and governments are also urged to use cleaner energy, stop massive deforestation, and invest in soil restoration. By doing so, CO2 will be absorbed by plants more efficiently. In the fashion industry, which accounts for 10% of global carbon emissions, flax is essential due to its high CO2 absorption capacity (European Parliament, 2020). Over 200 million trees are felled annually to produce plant-based materials such as viscose, and the Amazon Forest is heavily deforested to make room for livestock farming. This contributes to fibre production for leather goods such as bags, shoes, and belts. (Canopy Planet, 2021)

Legal Factors - Various laws regulate environmental impacts, such as the European Air Quality Policy. In 2030, this aim is to reduce premature deaths from ground-level ozone by half. "European Green Deal" encourages global companies to reduce pollution, and CO2 emissions are taxed per ton by countries. Apart from environmental laws, Portugal has one of Europe's highest corporate tax rates at 21%, which poses challenges for Portuguese textile companies. Thus, taxes are an additional challenge for Portuguese companies.

4.2. SWOT Analysis

A SWOT analysis is a valuable tool for assessing a company's resources and abilities before defining its strategy and attracting new clients. Figure 2 shows the strengths and weaknesses of a linen company *vs* opportunities in national/international markets. Additionally, it identifies possible threats to the company's growth.

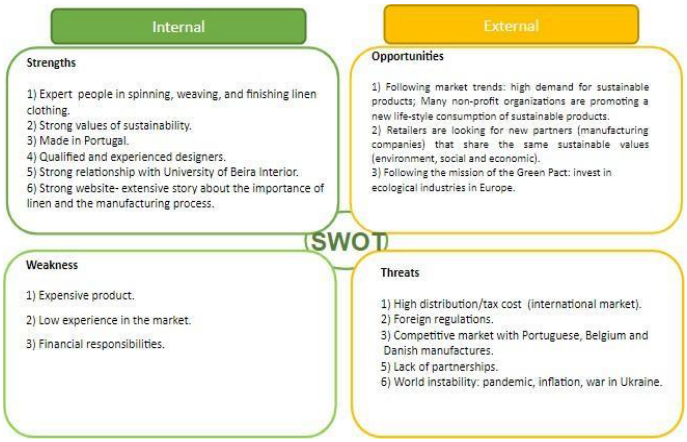

Fig.2. SWOT Analysis of a new linen company

Investing in a new linen business/factory involves building facilities, installing machinery, and hiring specialized staff. Financial responsibility and market immaturity are weaknesses since linen processing is time-consuming, contributing to higher costs and limiting accessibility, as (i1) stressed. Centralizing manufacturing processes in Portugal will also allow better control over production levels, possibly reducing costs. A company's strength lies in its expert staff, which ensures high-quality linen supplies in Portugal. By collaborating with the University of Beira Interior, students could be involved in the production process, promoting employee recruitment.

Externally, the company can benefit from the increasing demand for sustainable products and align itself with market trends (as i1 reported). Although the share of sustainable products on the market is still relatively low, as organic cotton only accounts for 0.96% of the total cotton market (26.2%), consumer preferences are shifting towards eco-friendly brands. Offering products made from eco-friendly fibres meets this demand and supports the European Green Pact goals. In addition, the linen company has the potential to become a significant player in the European linen production sector, as only a few companies

produce clothing made from 100% linen.However, external threats include high distribution costs when selling to other European countries. Linen companies' responses indicate that global logistics management is a significant challenge, including complicated transport logistics, tax implications, and compliance with foreign regulations. Overcoming these challenges will be critical to the success of the linen company in the European market, according (i1).

4.3. Five Forces of Porter Analysis

As the fashion industry has grown over the last two decades, consumers have more options and have lower switching costs. This dynamic negatively impacts Linen Portuguese Textile due to the lower prices of fast fashion brands compared to sustainable linen products. Under Porter's Five Forces approach, Table 2 analyses the scenarios where a new Portuguese linen company thrives.

Table 2: Five Forcers of Porter approach considering the scenarios where a new Portuguese linen company thrives

Consumer´s Bargaining Power	Supplier´s Bargaining Power	Threat of New Substitute Products	The Threat of New Entrants	Supplier´s Bargaining Power
A rapid growth of the fashion industry occurred in countries with high consumer incomes causing low switching costs for consumers and empowers them. This dynamic negatively impacts the Linen Portuguese Textile company, given the lower prices of fast fashion compared to sustainable linen products. If linen options are limited, higher switching costs favours the linen company, giving more power over consumers. The high differentiation between linen and synthetic fibres favours consumers, as synthetic fibres are less durable but more affordable. Natural fibres offer better quality/comfort, which reduces consumer power due to the high differentiation. If retail chains can produce the linen company's products, customers/retail chains have high bargaining power. Even so, this is not expected for Portuguese linen companies, which suggests lower customer bargaining power.	Major flax plant suppliers, have excellent bargaining power vis-à-vis the Portuguese linen company (high power) due to limited alternatives. Yet, the suppliers' dependence on the linen company is low, as their markets are well established (high power). Hemp, the closest substitute for linen, is only produced to a limited extent and does not pose a threat to suppliers (high power). Flax/linen production requires capital and technical knowledge, being unlikely a flax suppliers´ domain in the textile industry (low power) and benefiting the linen company.	Sustainable substitute fibres were considered: hemp, organic cotton and recycled polyester. While European companies are interested in sustainable options, the limited production of these fibres indicates a competitive market (high performance). Despite its durability and strength, hemp is slow to catch on due to its cost and associations with drugs. Consumers prefer organic cotton for sustainability reasons, affecting Linen Textile's competitiveness As recycled polyester gains market share, international brands are adopting it for sustainability, further influencing the linen company's power. Substitute products have high bargaining power, weakening the linen company. In addition, organic cotton's low conversion costs and recycled polyester's lower price adversely affect the linen company.	It is unlikely that many textile companies producing 100% pure linen will emerge in Portugal and Europe in the short term, as the production of linen is still costly. For this reason, linen fabric is targeted at a specific market. Building a textile company requires extensive capital (e.g. infrastructure, human labour, machinery) and a high level of manufacturing knowledge. Therefore, the Portuguese linen textile company is positively positioned on the market according to 'new entrants´ (low power).	Competitive analysis covers two segments: Portuguese linen textile companies and well-known foreign companies, including Dutch and Belgian companies. Polopiqué and Riopele rules in Portugal. Polopiqué specializes in organic cotton and linen spinning and strategically will install the first 100% linen spinning machine in Europe. Riopele has invested in modernization, making it one of Europe's most modern textile companies. Has a robust digital platform and produces sustainable products, including recycled fibers. Two indirect competitors, Somelos and TMG Fabrics, lack vertical integration. Somelos weaves cotton fabric, while TMG Fabrics manufactures garments. A Dutch trading company, Northern Linen BV, operates worldwide and has production facilities in Asia. Exports worldwide (Northern Linen and Linopersempre) and produces flax fiber, spinning, and weaving.

4.4. New Linen Factory Sustainability Plan

In the fashion and textile industry, sustainability is increasingly recognised to counteract the current negative environmental impacts. Thus, many companies incorporate sustainable practices and environmental impacts into their annual reports. The Higg Index measures the textile industry's environmental sustainability. Material Sustainable Index, part of the Higg Index, measures five environmental impacts: global warming, eutrophication, water scarcity, chemicals, and fossil fuels. These indicators for a new linen company are shown in Table 3.

Table 3: Environmental indicators to consider in a new linen manufacturing company (A) and its suppliers (B)

	Environmental Indicator	Indicator Assessment
A	Recovered Water	Rainwater used (%)
	Waste Reduction	Waste produced and reduced in factory (%)
	Fibres Reutilization	Fibres reused in the manufacturing process (%)
	Wasted Water	Wasted water in the manufacturing process (%)
	CO_2 Emission	Amount of CO_2 emitted by a kilo of fabric
	Energy Consumption	Amount of Energy consumption by a kilo of fabric
	Certified Materials	Certified materials (%) - GOTS, ISO 9001, ISO 14001, Master Linen - per fabric kg
	Dyes Type	Compliance with chemicals safety (ECHA European Chemical Agency
B	CO_2 in flax plantation	CO_2 (Tonnes) the flax plant(ation) will absorb during growth
	Water in Flax plantation	Water used (%) to produce a bunch of flax linen
	Fertilizers	Fertilizers used (%) to produce a bunch of flax linen

Applying these environmental indicators to a linen factory leads to the following results:

1. Install a rainwater collection system for spinning processes to reduce water wastage. Assess and minimize water wastage in subsequent production stages.
2. Establish eco-locations throughout the factory for proper waste collection and recycling. In waste management, follow the three Rs (reduce, reuse, recycle) principle, accenting quality and durable fibres.
3. Quality department collects fibres from spinning, weaving, and garment design for innovative reuse. Combine reused fibres with new ones to enhance durability and save resources and energy.
4. Achieve CO2 offsetting by producing flax linen (it effectively absorbs large amounts of CO2).
5. Monitor and reduce energy consumption, utilizing solar cells to generate clean energy.
6. Prioritize non-toxic chemicals and strictly use substances approved by the European Chemicals Agency (ECHA) to reach the certified materials goal.

Essential to assess supplier's production type (B in Table 2) for a sustainable value chain, considering the company's exclusive use of organic linen to minimize fertilizer use. Design's crucial role in sustainability involves selecting quality materials. Designers should follow principles like simple garment design, planning shapes before prototypes to minimize fibre waste, and efficient fabric cutting. Incorporate material information on garments, replace traditional labels, and consider creativity with natural materials like wood buttons and exploring natural dyes. Commercially, the manager and team should collaborate to forecast activity, ensure correct production levels, and maximize resources, including energy and fibre waste. Social commitments include ensuring good working conditions, promoting equality and inclusion, having a code of conduct, providing health insurance, and ensuring continuous professional development.

4.5. New Linen Factory Business Model Canvas

The Business Model Canvas (BMC) is a strategic management tool that visually represents a company's key components and how they work together to create, deliver, and capture value. Businesses and entrepreneurs often use it to describe, design, challenge, and pivot their business models. The BMC typically consists of several building blocks or elements, each representing a fundamental aspect of a business. These elements include (i) Key partners, (ii) Key activities, (iii) Key resources, (iv) Value propositions, (v) Customer relationships, (vi) Channels, (vii) Customer segments, (viii) Cost structure and (ix) Revenue streams. BMC is usually presented as a visual chart with each building block represented as a separate section, allowing for a comprehensive overview of the business model on a single page. This tool is top-rated in the startup and entrepreneurial communities for its simplicity and effectiveness in articulating and refining business models.

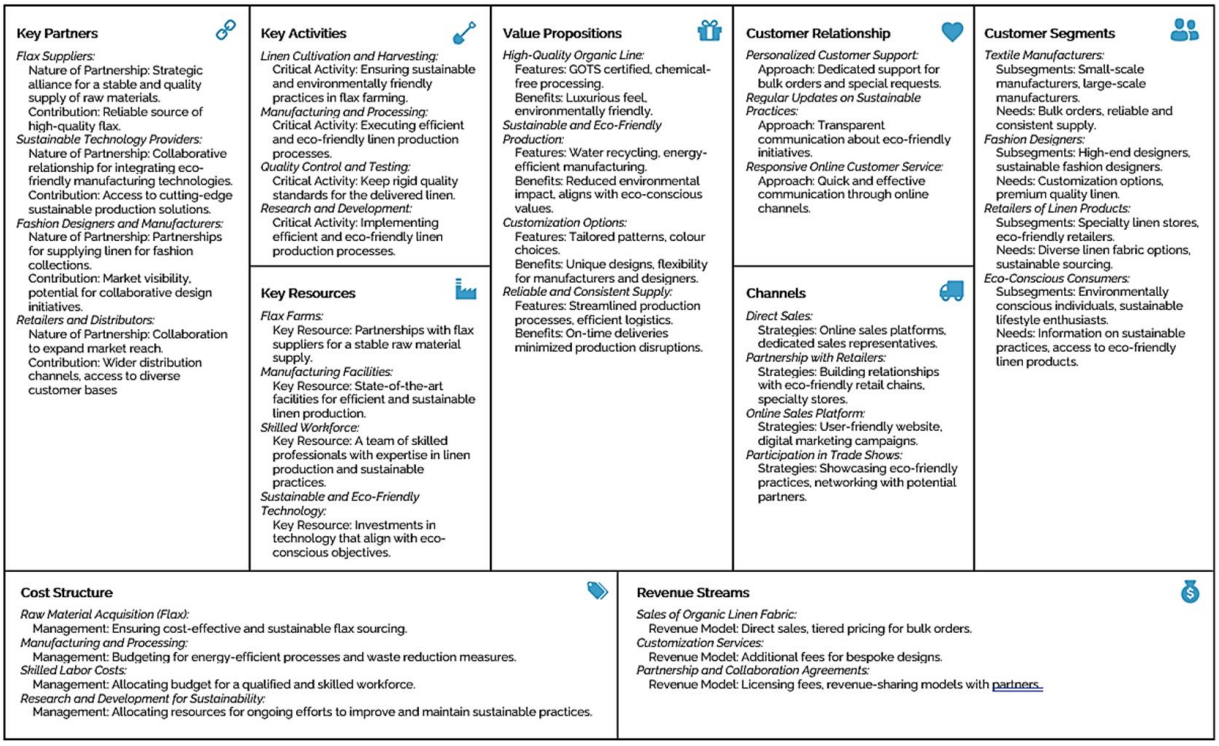

Fig.3. Canvas Model of a new linen company

Figure 3 presents a detailed breakdown that offers a broad view of each field within the Business Model Canvas for a Linen Factory, highlighting critical aspects, strategies, and contributions in each category.

5. Conclusion

The higher cost of natural fibres makes switching to them challenging for companies. Considering this, consumer education is key to making more sustainable choices; thus, manufacturers and fashion companies should promote natural fibre benefits. Fast fashion contributes significantly to environmental degradation and emphasises the need for consumers to choose sustainable clothing. Consumers can reduce the environmental impact of textile production by considering more sustainable fibre types and production locations. The Linen Factory's commitment to sustainable practices guided by CE principles minimises waste and encourages recycling. Strategic partnerships and a focus on resource efficiency emphasise the company's environmental commitment. Moreover, offering customisation options for textile manufacturers and fashion designers aligns with CE principles and promotes durable and sustainable fashion. Also, direct selling minimises the number of intermediaries and is an example of a lean and environmentally friendly business model. The emphasis on sustainability in research and development demonstrates a commitment to continuous innovation.

Diversified revenue streams, including organic linen fabrics and customised services, contribute to a circular consumption pattern, and effective cost management ensures a balance between financial considerations and sustainable goals and supports a circular cost structure. Extending product life through high quality, durable linen is in line with CE principles and builds partnerships to promote sustainability across the industry. However, despite the benefits, adopting a sustainable linen manufacturing process faces challenges such as high initial investment, funding barriers and weather-related supply chain uncertainties. Complying with environmental regulations, adopting sustainable technologies, and disrupting the global supply chain are additional hurdles. Keeping competitiveness in the face of price pressure from unsustainable alternatives and unpredictable market trends requires strategic planning. In regions where there is no suitable infrastructure for waste disposal, efficient recycling, and compliance with CE principles, competition may be jeopardised. So, coping with economic downturns and currency fluctuations requires careful financial planning. Despite these challenges, Linen Factory's commitment to sustainable practises remains a key factor in its long-term success in a circular economy.

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