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STRATEGIC BUSINESS MODELS IN THE LEATHER INDUSTRY: GENERAL BUSINESS MODEL DEFINITION AND EVOLUTION IN THE LEATHER INDUSTRY

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ABSTRACT

This report examines business models in the Leather Industry while putting an in-depth focus on the integrated, raw to finished leather, business model. To correctly frame the industry there's an industry overview that explains the common misconceptions made by the consumer. Major interviews were conducted with industry experts as to gain insights to evaluate the business model strategic advantages as well as vulnerabilities and discuss them according to a logic proposed by the Business Model Canvas. At last, there are recommendations on how to improve leather quality in slaughterhouses and how to change the consumer mind and introduce them to the truth: Leather is a Recycled and Sustainable product.

KEYWORDS: Tannery, Leather, Sustainability, Traceability, Business Model, Innovation, Optimization, Byproduct, Tanning, Strategy, Evolution, Variation, Wastewater, Chrome, Strategic Partnerships, Recycling, Integrated, Positioning, Customer, Business Model Canvas, Value Positioning, Residues.

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2. General Definition of Business Models

The term ***business model*** has become a **central concept in management literature**, yet despite its widespread use, its meaning remains contested and fluid. Scholars from a variety of disciplines, including **strategic management, entrepreneurship,** and **information systems**, have attempted to define it, often arriving at differing interpretations. Zott, Amit, and Massa (2011) emphasize this ambiguity, noting that "the business model has become a new unit of analysis" but lacks a universally agreed-upon definition. This **conceptual flexibility** can be both a strength and a limitation, allowing for rich, multidisciplinary perspectives while simultaneously making it difficult to operationalize the term in empirical or industry-specific contexts, such as the leather sector.

The **historical evolution** of the business model concept reveals how it has been shaped by broader **economic and technological changes**. One of the earliest uses of the term was by Bellman et al. (1957) (Peric, Durkin and Vitezic 2017, 3; Osterwalder, Pigneur and Tucci 2005, 4), who employed it in a mathematical context to simulate business environments (Peric, Durkin and Vitezic 2017, 3). Later, Chandler (1962, 314) highlighted the importance of **aligning strategy and organizational structure**, laying the groundwork for later discussions about how **firms create and capture value**. The proliferation of the internet in the 1990s accelerated interest in business models, especially in relation to digital platforms and e-commerce. Timmers (1998, 4) defined a business model as "an architecture for the product, service and information flows, including a description of the various business actors and their roles," introducing the idea that business models are not static entities, but complex configurations of activities and actors (Timmers 1998, 4-6).

Osterwalder, Pigneur and Tucci (2005, 6) offered one of the most influential contributions to this discussion by identifying four stages in the evolution of the concept: classification of models, component identification, model development, and integration into strategic theory.

Their work is particularly notable for proposing the **Business Model Canvas**, which formalized **nine components**, ranging from value proposition to customer segments and cost structures, as fundamental to understanding how businesses function. This modular view allowed scholars and practitioners to **systematically map and analyse** the configuration of business activities and value flows (Osterwalder, Pigneur and Tucci 2005, 10).

Academic definitions of business models generally fall into several categories: **technological, economic, strategic, and operational** (Teece 2010, 173-179). Each perspective highlights different aspects of business logic and structure. For instance, Amit and Zott (2001, 494) focus on value creation through transaction structures and governance, seeing the business model as "a structural template for how a focal firm transacts with customers, partners, and vendors". Magretta (2002), by contrast, frames business models as narratives, "stories that explain how enterprises work," focusing on the customer, the value they receive, and the logic through which the firm delivers that value profitably. Teece (2010, 191) views the business model as "**the design or architecture of the value creation, delivery, and capture mechanisms**", linking it closely with strategic adaptation and innovation.

Each of these definitions brings attention to slightly different functions. Magretta emphasizes clarity and simplicity, particularly in communicating **how the business delivers value**. Teece emphasizes dynamic capabilities and the need for constant adjustment in volatile markets. Meanwhile, Osterwalder and Pigneur (2010, 14) articulate a more operationally grounded view, presenting the business model as the underlying logic by which an **organization creates, delivers, and captures value**. Their canvas framework became a widely adopted tool in both entrepreneurial and corporate contexts, helping firms visualize how each component contributes to overall performance (Osterwalder and Pigneur 2010, 152).

Underlying many of these perspectives is a shared concern with *value* and its creation, delivery, and capture. According to Fenyang and Ates (2017, 1-2), value theory offers a foundational

lens for understanding the business model concept. Their work argues that the core of every business model lies in how value is perceived, produced, and exchanged between the firm and its stakeholders. Building on this, Richardson (2008, 139) proposes a **tripartite framework comprising value proposition, value creation and delivery, and value capture**. The *value proposition* articulates what the company offers and why customers should care. *Value creation and delivery* describe the operational processes and relationships that transform inputs into outputs. *Value capture* addresses how the firm appropriates some portion of the value in the form of revenue or strategic advantage.

This **value-centric view** is especially helpful in clarifying **why business models matter**. Value itself is a subjective and multifaceted concept; it varies across stakeholders and over time. As Fenyang and Ates (2017, 6-8) note, value is shaped by both normative expectations (what customers or firms consider desirable) and evaluative mechanisms (how they assess outcomes). The business model, therefore, acts as a **bridge between the firm's internal logic and the external perceptions** of its customers and partners. This insight is critical for industries like leather, where value is not only economic but also tied to symbolic, aesthetic, and ethical considerations such as sustainability and craftsmanship.

In their review of business model literature, (Peric, Durkin and Vitezic 2017, 7) argue that despite the definitional heterogeneity, most academic approaches converge on several core components: a customer value proposition, a set of key resources and processes, and a profit formula. Similarly, Shafer, Smith, and Linder (2005, 202) identify four recurring themes across definitions: strategic choices, value networks, a system of resources and processes, and customer interfaces. This convergence suggests that while the outer form of business models may change across sectors or over time, their inner logic often adheres to similar principles.

The recognition of this convergence allows us to **frame business models not as rigid templates**, but as **adaptable systems** guided by purpose, context, and the nature of value

exchange. As Andreini, Bettinelli, Foss and Mismetti (2022, 1090, 1105-1107) argue, the business model serves as both a descriptive and normative construct: it describes how a firm currently operates and **suggests how it might evolve** in response to changes in technology, market demand, or regulation. This dual nature is particularly relevant when examining traditional sectors like the leather industry, which are being reshaped by global supply chains, digital transformation, and consumer demand for ethical production. Understanding the foundational definition of a business model thus becomes the necessary precondition for analysing how firms in such industries structure their activities, deliver value, and adapt to evolving pressures.

Fielt (2014, 96) deepens this synthesis by proposing a clear and integrated view of the business model structured into **four essential dimensions**: value proposition, value creation, value delivery, and value capture. The ***value proposition*** refers to the offerings and benefits delivered to customers. ***Value creation****, or organizational architecture,* focuses on the internal processes, resources, and partnerships that generate these offerings. ***Value delivery****, or customer,* involves the mechanisms through which the value reaches the customer, including distribution and relationship channels. ***Value capture****, or economic dimension,* represents how the firm monetizes its efforts, typically through revenue models and cost structures (Fielt, 2014, 96).

This framework helps reconcile different streams of business model literature by showing that while terminology may vary the underlying concerns are consistent. Fielt's analysis shows that these elements are not independent but ***interdependent****,* adjusting one impacts the others. Zott, Amit, and Massa (2011, 1024) similarly emphasize that business model design requires considering how components are linked and aligned. This insight is especially relevant in sectors like the leather industry, where shifts in value proposition (e.g., towards eco-leather) affect sourcing practices (value creation), distribution logistics (value delivery), and pricing strategies (value capture).

Furthermore, Gassmann, Frankenberger, and Csik (2014, 2-4) contribute to the synthesis by presenting business models as **structured configurations** rather than mere lists of components. Their *Business Model Navigator* highlights recurring patterns, such as "freemium" or "long tail", that suggest **business model innovation** often occurs through recombination of existing elements rather than radical invention. This aligns with Johnson, Christensen, and Kagermann's (2008) emphasis on the need for coherent alignment across the model: the fit between elements determines **strategic success**.

As Fielt (2014, 96) notes, a mature understanding of the business model requires viewing it as a holistic logic of how a firm operates, one that spans the entire value system. In this view, business models are **not just operational tools, but conceptual frameworks** that reflect both internal configuration and external market positioning. When applied to a specific industry, such as leather, this model-based lens allows analysts to identify not only how value is created and delivered, but also how firms can innovate by rethinking the configuration of these interdependent elements.

3. Evolution of Business Models in the Leather Industry

This section seeks to explore **how business models in the leather industry have evolved** over time in response to technological, economic, and social transformations. By examining distinct historical periods, from pre-industrial craftsmanship to the rise of mechanized production and the current era of globalized supply chains, it becomes possible to identify the key shifts in how value has been created and captured within the industry. Understanding this progression not only highlights the adaptive nature of leather businesses but also provides essential context for analysing the strategic models in use today.

3.1. Medieval Era

One of the most fundamental industries in our society and with a very **significant historical presence** is the **leather sector**, and the derivatives resulting from its transformation. Its roots in human civilization extend back thousands of years, since, in the first societies, there was an incessant **search for highly durable materials**, which could be applied in different contexts, allowing humans to protect themselves from the elements. Due to this need, the hide of various animals, both domestic and wild, was seen as a key solution to solving this problem. The earliest evidence of hide processing techniques has been found in archaeological discoveries at Qesem Cave in Israel, and other Palaeolithic sites. Here, an analysis of stone tool wear reveals that these actions date back 400,000 years, suggesting that humans used leather for protection, showing the association between this action and human survival (Philippine News Agency 2024). More recent archaeological studies at the Counterbandiers cave in Morocco confirm the existence of specialized bone tools, which demonstrate the first documented cases of **systematic treatment of hides** by homo sapiens around 120,000 years ago. This discovery shows a clear transition from the passive use of hides to deliberate techniques of treatment and processing (Lazri, Rigal, Hutson, Humphrey, Bouzouggar and Hublin 2021).

Over time, human communities began to settle and develop more structured economies. Thus, as with other goods, leather began to assume a **new role**, not only as a material for survival, but also as a **product of added value**, due to its importance and treatment techniques. In Merhrgarh, in the Neolithic period (7000-3000 BC), red ochre and hide scraping tools were found in a burial context, suggesting **early tanning practices** associated with the need for conservation (de Vartavan, 2014, 59). In Mesopotamia, leather goods such as rudimentary footwear and belts are mentioned more than 270 times in Sumerian texts under the term *KuS*, and their presence in administrative records demonstrates that leather was already a standardized and monitored good (de Vartavan, 2014, 59). Similarly, in ancient Egypt, there

were already **workers specialized in leather treatment** (mskA), which was widely used in both military and religious contexts, thus highlighting the differentiation of products and the increase in specialized production work (Morgan 2020).

In India, leather is referenced in Vedic literature (1500-500 BCE) as the term Carman, which described both the treated material and the craftsman, highlighting leatherworking as a socially defined occupation (Wisdom Library n.d.). On the other hand, the Areni-1 shoe from Armenia, dated to 3500 BCE, exemplifies refined vegetable tanning for specialized production (Ravilious 2010). In the Roman Empire, leather production reached large scales, through its use at military, administrative and civil levels. Roman leatherworkers produced a range of products, such as tents, belts and armour, in state coordinated shops demonstrating a more **centralized and functionally differentiated business structure** (Barbe n.d).

3.2. Middle Age Era

Following the emergence of tanning techniques in ancient civilizations, leather production entered a **long-standing artisanal phase** that shaped its structure between the 5th and 18th centuries. In this period, production became embedded in small-scale, community-based systems defined by tradition, manual labour, and local material cycles (Carmen 2024). **Business models were decentralized**, built around workshops where the same family or social group controlled all stages of tanning and selling, typically to regional markets or institutional patrons.

In Europe, particularly during the Middle Ages, leather production was regulated by guilds that defined training rules, price controls, and access to the trade. Tanners and shoemakers formed professional associations that transmitted knowledge through apprenticeships and coordinated market participation. Sales took place through local fairs, town markets, or by commission for military and religious institutions, forming a **semi-formal business model controlled by guild charters** (Carmen 2024). Archaeological records reveal well-structured tanning facilities near

rivers, confirming the existence of stable, regulated production environments (Thomson and Mould 2011).

In Portugal, regions like Alcanena developed by the 16th century into **leather production hubs**, where family-run workshops managed the entire process, **from raw hides to final products**, relying on oak bark, lime, and river water. These operations followed a model based on intergenerational craft, low capital intensity, and strong local ties. Products were sold directly at markets or fairs, with little external distribution (Leather & Cotton London 2019).

In India, leather tanning was controlled by hereditary castes such as the Chamars. These groups fulfilled village demand under traditional systems of reciprocal labour, where payments were often in kind rather than currency. Their distribution relied on religious festivals, local networks, and caste-based commerce (Darlong 2019). This structure, while informal, **was functionally integrated and stable**, combining production and trade within the same community unit.

Across these regions, the artisanal **leather business model** was characterized by **low specialization between production and sales**, reliance on inherited techniques, and strong embedding in social structures. It offered sustainability and cultural continuity but also limited scalability.

3.3. Industrial Revolution Era

Following centuries of artisanal production embedded in local traditions, the leather industry underwent a profound transformation during the **Industrial Revolution**. Between the late 18th and 19th centuries, leather production shifted from small-scale workshops and family-run tanneries to large-scale, mechanized operations that introduced new business models, organizational structures, and market dynamics. This transition redefined leather not only as a craft product but as a standardized industrial commodity, produced for mass markets and integrated into international trade networks.

The emergence of **mechanized tanning processes** played a central role in this shift. The adoption of steam power, mechanical splitters, and rotary drum systems allowed for a significant increase in throughput and consistency, allowing for larger-scale production and the establishment of large-scale factories (Sharma 2018, 1619).

By 1858 the development of **chrome tanning**, marked a new era in the leather industry (Leather Dictionary n.d), which supplanted vegetable-based methods in the latter half of the 19th century, reduced tanning time from several months to a matter of days, enabling large-scale production of softer, more flexible leather suited to the expanding demands of industrial society (Baldua, 2020)

This technological shift was accompanied by **business structure changes**. Capital requirements increased as production now relied on machinery, chemical processing, and specialized labour. For example, in early 19th century Britain, approximately 3,500 producers in England and Wales were registered as operating in the tanning and related trades, each subject to government-issued licenses and taxation schemes that enabled direct regulation by the board of excise. Tanners were typically well-capitalized businesses, with average holdings of £4,500, which demonstrates the shift toward fixed-capital-intensive production units, replacing the fluid, informal economic relationships of the artisanal period. (Riello 2006, 366). In France, the state attempted to centralize the leather trade by organizing markets such as the Halle aux Cuirs in Paris and imposing regulations to ensure supply for the national army during the Napoleonic Wars. However, unlike Britain, the French industry remained scattered, and despite Paris becoming a major center of commerce, actual tanning and production were largely decentralized until well into the 19th century (Rielo 2006, 369).

During this period, in a global level, industrialization laid the foundation for **international sourcing and export-driven business models**. By the end of the 19th century, leather industries in Europe and North America began importing hides from Latin America, India, and

Africa, establishing **global supply chains** that were responsive to price and material availability (Watson and Clifford 2014).

3.4. 20th Century to Modern Era

Over the course of the 20th century, the business models of the leather industry underwent significant structural transformations, driven by factors such as **large-scale industrialization**, **global market integration**, and **advances in technology and logistics**. As production shifted to mechanized factory systems, a new business logic emerged, focused on **productive efficiency, functional specialization, and geographical fragmentation of the value chain**. (Interview of Mr. Pedro Marques, 2025).

In the early decades of the century, advances in transport, communication, and international trade expanded the reach of leather producers. The emergence of synthetic materials like plastic and rubber introduced competition in some markets, but leather retained its value in high-end and durable goods segments (Sharma 2018, 1619). In response to these changes, companies began to adopt more flexible and modular business strategies.

By the 1980s, early waves of **globalization**, combined with rising labour and environmental costs in the West, led to the fragmentation of production. Many leather goods manufacturers began outsourcing tanning and finishing operations to countries such as India, Pakistan, and later China, where lower labour costs and fewer environmental regulations made production more economically viable. This gave rise to a new business model built on **externalized production and functional specialization**. Brands and retailers based in developed countries increasingly focused on product design, brand positioning, and global logistics, while manufacturing was contracted to firms in the Global South (UNIDO 2010, 85).

In Portugal, the 20th century brought gradual but significant modernization to the leather industry, especially in regions like Alcanena and São João da Madeira. Tanneries transitioned from traditional vegetable tanning to chrome tanning, supported by investments aimed at

improving productivity and infrastructure. From the 1970s onward, **environmental concerns** became central to the sector's business models, leading companies to invest in cleaner technologies, wastewater treatment, and improved working conditions. This positioned Portugal as a competitive player in sustainable and high-end leather markets (CTIC n.d.).

By the end of the 20th century, the global leather sector had shifted toward **decentralized, internationalized**, and **specialization-driven business models**. Firms across different regions assumed distinct roles in global value chains, with some focused on raw material transformation, others on manufacturing, and others on branding and retail. This model laid the groundwork for the structural challenges and transitions that would emerge in the 21st century.

1. Introduction

1.1. Motivation and Relevance

This thesis was motivated by a shared **personal and professional connection to the leather industry**. While one of the writer's leather backgrounds goes back to his grandfather that owned a leather factory in the same village as where the 2nd writer was born and currently works. Even though that the former does not currently intends in pursuing a career in this industry the latter is currently working in the industry and has everything set to pursue a long-term career in the leather business. This coincidence has added a layer of local relevance and historical continuity to our research.

Foregoing of personal ties for the rest of the report, the leather industry presents a valuable case for academic review as it's of complex and evolving nature. The leather industry, although overlooked, is in its core a **recycling industry**, repurposing a **byproduct of the meat sector** into a durable, high-value material. As sustainability awareness increases in all areas from common consumers to policy dynamics, it is fundamental to understand how this industry contributes to reducing waste and how it can contribute to a **circular economy**.

The aim of this report is to compare different business models in the spectrum of stages that leather transformation occurs, from raw hides to finished leather ready to be applied in the fashion industry among others, to identify approaches that enhance operational efficiency, sustainability efforts and consumers idea about leather. This research is expected to contribute to companies wanting to better understand their position in the market as well as to what they could do to maximize their efforts across different areas.

1.2. Report Structure

Besides the personal and professional basis for this report, this report aims to create an understanding of how business models have evolved and how they may vary across the industry, as well as giving an industry overview to those who are not yet are familiarized with the industry. An in-depth analysis of how the business model of integrated tanneries, tanneries that convert raw hides into finished leather, is provided. Concluding, are presented some recommendations to how tanneries might navigate quality and traceability demands as well as consumer perception of the leather industry and derived products.

1.3. Methodology

This report aims to address **two core research questions**: **how to improve leather quality at its earliest stages, and how to reshape public perception of leather and its industry**. To explore these questions, a methodology was designed that combines a structured theoretical framework with the collection and interpretation of qualitative and quantitative data.

The analytical foundation of this project is based on the **Business Model Canvas** developed by Osterwalder and Pigneur (2010, 14-49), which allows for a comprehensive understanding of how organizations create, deliver, and capture value. By applying this framework to the integrated tannery model, covering operations from raw hides to finished leather, the analysis

can dissect each strategic dimension of the business model and assess its impact on operational performance, value creation, and alignment with market demands.

Due to the **limited availability of detailed documentation** on the technical and strategic configurations of business models within the leather sector, this research also incorporates original data obtained from various industry professionals. These insights were gathered through **interviews** with managers, technicians, and commercial specialists from Europe, South Asia, and South America, all of whom operate in several parts of the leather value chain. Their perspectives proved essential in understanding the practical challenges associated with sourcing, production, sustainability requirements, and traceability standards. A full list of the interviews conducted can be found in **Table 3**.

In parallel, quantitative data regarding market structure, customer segmentation, and industry trends were integrated to contextualize the analysis and support broader generalizations. The combination of a well-established theoretical lens and first-hand industry insights ensures that the response to the research questions is both analytically rigorous and grounded in real-world dynamics.

6. Business Model of Tannery Operations: A Canvas-Based Analysis

In this section, it is analysed the business models of integrated tanneries **using the Business Model Canvas (BMC) framework** developed by Osterwalder and Pigneur (2010). The BMC provides a structured way to **understand how these companies operate across key strategic and operational areas**.

While many approaches to business models exist, the BMC stands out due to its flexibility and broad applicability across industries. According to Fielt (2014, 92), business models can be understood as representations of an organization's value logic—the way it creates and captures value. The BMC gives this concept a practical structure by addressing elements such as **Key Activities, Value Proposition, Customer Relationships, Key Resources, Cost Structure,**

Customer Segments, Channels, Revenue Streams, Key Partnerships (Osterwalder and Pigneur 2010, 44). These components provide a clear and visual way to dissect how a company functions and where its strategic priorities lie.

In the sections that follow, each block of the Business Model Canvas will be applied to the specific case of integrated tanneries. This analysis will allow us to better understand how value is created, delivered, and captured in this industry, and identify potential areas for strategic development or innovation.

6.1. Key Activities

At the core of the tannery business are the technical and operational processes required to **recycle waste of the meat industry** into a new usable product, convert raw hides into usable leather. The process begins with **sourcing raw hides** from slaughterhouses followed by stabilizing the leather chemically with **soaking, liming and tanning**. After making the hides stable, they can be called leather and are put through **retanning** processes that will define color, softness and fullness. As a last process before they are ready to be used, they go through **finishing** processes that adjust color, patterns, milling effect and touch (Leather Naturally n.d.).

As regulatory pressures increase key activities have expanded to fields such as wastewater treatment (described in **Annex A**), solid waste disposal, (Buljan, Jakov. 2005) and compliance with environmental standards such as **REACH** and **LWG certification** (Buljan, Jakov. 2005) To adjust the industry to these new standards departments of **Research and Development (R&D)** have taken a higher position as a strategic investment. To comply with requirements of brands such as HM, only use chrome free leather, as well as having another set of points in water consumption, (Interview of Mr. Pedro Marques, 2025) there's a need to constantly innovate and develop new and more sustainable products (Is It Leather? n.d.). In parallel, digitalization is gaining ground, with ERP systems, traceability platforms, and automated production controls streamlining tannery operations (Smit and Zoon n.d.).

Logistics and inventory take a high toll on tanneries as the reception and delivery process takes around 21 days, however to source leather from the slaughterhouses or suppliers can take up to more than 60 days due to the need of moving leather through maritime transports (Interviews of Mr. Gerry Lievendag, Mr. Jimmy Frazão and Mr. Luís Mota, 2025). Depending on how customers are structured they can either place orders seasonally, twice a year, (Interview of Mr. Nambi, 2025) or regularly to deliver under 2 months (Interview of Mr. Titus King, 2025).

6.2. Value Proposition

Tanneries deliver value on three main axes: **material quality, technical performance, and sustainability**. Technical performance is defined by properties such as grain texture (Dressman 2023), softness, thickness, colorfastness, and water resistance, all of which are tailored to client specifications (Marvin 2022). Customization creates a competitive advantage as it sets up high levels of differentiation. Examples of this are embossed leather, extra thin or high thickness for luxury footwear.

Sustainability has grown from a niche demand to a mainstream requirement. Traceable sourcing, chrome-free processes, and water recycling initiatives are being widely adopted (Interviews of Mr. Federico Biagioni, Mr. Bruno Parreira and Mr. Nuno Rebelo, 2025). **Certifications** like the LWG Gold Rating or ISO 14001 serve as external **signals of credibility and environmental responsibility** (Interviews of Mr. Titus King and Mr. Prabu, 2025).

Finally, in countries with a deep tradition of craftsmanship, such as Italy and Portugal, heritage becomes an intangible asset. Emphasizing artisanal techniques and regional identity contributes to branding and client loyalty.

6.3. Customer Relationships

As previously described, integrated tanneries base their business model on the treatment of hides from their raw stage until they are fully tanned leather. These companies' main type of

clients are businesses, across various sectors, that seek the finished product and can therefore be characterized as operating within a **Business-to-Business (B2B) framework** (Interview of Mr. Pedro Marques, 2025).

Customer relationships within this model vary substantially depending on the **size, strategic priorities, and procurement logic of each client**. Integrated tanneries serve both large multinational corporations and smaller, regionally focused brands. The nature of these relationships ranges from **long-term** (Soohyo Kim and Choyeon Kim 2024), **collaborative partnerships to short-term, cost-driven engagements**. Some clients, particularly those in niche or premium segments, value continuity, product customization, and shared sustainability goals, maintaining stable relationships with suppliers over time. These clients are frequently involved in the development of specific finishes or technical adjustments and often prioritize quality and brand alignment.

A significant portion of clients, especially **large international manufacturers**, operate under **price-sensitive procurement strategies**, in which cost per square meter is the main driver. These companies tend to place **large-volume orders** and demonstrate **greater supplier turnover**, switching sources when more competitive pricing becomes available. Despite their cost orientation, these clients often lead the transition toward chrome-free or chrome-zero tanning methods, in response to corporate ESG policies and environmental branding requirements (Interview of Mr. Ricardo Fojo, 2025). This creates pressure for suppliers to **reconcile cost efficiency with compliance to sustainability and traceability standards**.

Clients in all segments generally require comprehensive documentation related to product origin, environmental compliance (e.g., REACH, CITES), and material performance. Large industrial buyers often demand real-time communication, digital access to certification, and logistical tracking (Interview of Mr. Pedro Marques, 2025). These systems support transparency and efficiency in order fulfilment. In certain markets, especially those that are

geographically distant, customer relationships are managed through intermediaries or local agents. This model may reduce direct visibility and limit the ability of the tannery to control communication and service quality.

6.4. Key Resources

Tanneries rely on several physical infrastructures such as tanning drums, drying tunnels, finishing machines, chemical storage facilities, and wastewater treatment plants—**each requiring significant capital investment** (Interview of Mr. Lucas Maciel, 2025).

Skilled labor is equally vital. Tanning is a complex craft that combines chemical precision and artisanal expertise (Interview of Mr. Alfredo Crispim, 2025). Even though that are some tanning schools around the world, in Turkey, India, Mexico, Spain (Leatech and ILT Chennai) among others, these aren't many and, in many cases, skills are passed down through generations, particularly in regions with strong tanning traditions (International Leather Maker n.d.).

Lastly, certifications, such as those for environmental compliance or ethical labor, have become crucial for market access. These credentials help build trust with buyers and are increasingly mandatory in global supply chains (Leather Naturally n.d).

6.5. Cost Structure

Before presenting the cost structure there's a need to say that this point was developed with the insight of Dr. Augusto Batista the CFO of Derma-Leather. Percentages are presented in terms of the price passed to the customer, the sale price. Moreover, the cost structure presented refers to companies that have its manufacturing units in Europe as for other parts of the world there will be differences more notably in the energetic and waste management sectors.

The 1st point stated by Dr. Augusto Batista is that for a tannery **to be financial beneficial is that it must have a gross margin of around 30 to 35%**. **Only 7% to 8% will be converted as profits**.

Tannery operations have a capital-intensive and environmentally sensitive cost structure. In terms of **Cost of Goods Sold**, tanneries **biggest cost input is the raw materials** which price fluctuate with demand, origin and breed (Interview of Mr. Pedro Marques, 2025). Together with chemicals, and water consumption, major in wet processing phases (UNIDO Leather Panel n.d.) it makes about **40% to 50% of the final price**.

Labor Costs are quite significant and by industry metrics shared by Dr. Augusto Batista, must account for a maximium **between 15% and 20%**.

Energy costs have been rising in the last few years as a direct result of the world conjecture, in particular the pandemic and the Russia and Ukraine war. Counterbalancing these facts the use of **solar panels** and other **renewable energy sources** such as **boilers based on biomass**, pellets, have helped get energy costs under control and under or in-between the **threshold of 10 to 15%**. Nevertheless, these renewable energy sources are medium to long term investments. At Derma-Leather several investments were made such as a boiler that operate on biomass and solar panels that account to 0,97 Mega Watts per hour (Interview of Mr. Pedro Marques, 2025). As a term of comparison, a Tesla Model 3 uses around 0,0147 Mega Watts per 100 kilometers, km, (Electra 2025). With one hour of energy, it would be possible to drive up to a little under 6600 km. That's the same distance as going from Nova SBE up until New Delhi, India or Lagos, Nigeria. The investments were said to represent massive capital investments, with figures around 278600€ for the boiler and 488000€ for the solar panels.

Administrative costs should not exceed 5%. These include depreciation of equipment, insurance, R&D investment, and marketing. For vertically integrated tanneries that operate

downstream brands or product lines, further costs include packaging, e-commerce logistics, and customer service (IBISWorld n.d.).

Environmental compliance introduces additional costs. These include effluent treatment, emissions monitoring, and obtaining third-party certifications. While costly, such measures are necessary to avoid legal penalties and to retain clients committed to sustainability (WorstPolluted.org n.d.; Is It Leather? n.d.). Still on the point of legal penalties these are classified on 3 major points: light, severe and very severe. In Portugal they can be classifies at a national level or at a local level. At the local level the penalties can go from 1500 to 22000€ for light penalties, for the second type it goes from 4500 to 44000€ and for the very severe it goes from 13500 to 44890€, (Aquanena 2023). However, while conducting interviews these penalties were presented as being a value of mere exposition by Aquanena, the local company that takes care of the wastewater at Alcanena. More severe than these penalties and what normally follows them is the penalties according to National Law. If there are found any contaminants above the limit the penalty is calculated by multiplying the average consumption of water in the last 12 months by 4 (Diário da República 2000).

In **Figure 1** it is demonstrated a possible distribution of costs as well as including a gross margin to make the business prosperous for a European tannery.

6.6. Customer Segments

The main customer segment of the leather industry is the footwear industry, which represents 37.8% of total sales in the European Union (Euroleather n.d). In this industry, customers are differentiated by their production volume, ranging from **large-scale manufacturers to smaller artisanal brands** (Interview of Mr. Ricardo Fojo, 2025), with both types of customers having very high requirements in terms of technical specifications and product quality (Interview of Mr. Pedro Moleiro, 2025). The second largest leather purchasing sector is the **leather goods and fashion sectors**, which accounts for 22.3% of the market

(Euroleather n.d). This includes the production of bags, belts and wallets, typically focused on high-end finishes, which results in smaller production batches (Interview of Mr. Titus King, 2025).

Two other sectors with similar market shares are the **automotive and aviation industry** with 13.4% and the **upholstered furniture industry** with 13.3% (Euroleather n.d). The first is characterized by strict requirements in terms of durability and safety, while the second is defined by elevated standards related to resistance, product longevity, color uniformity, and tactile properties. Both sectors impose rigorous safety specifications, particularly concerning flame resistance, as the leather used must meet non-flammability standards (Interview of Mr. Lucas Maciel, 2025).

Finally, the **garment industry** accounts for 11.4% of the EU's leather production and the remaining 1.8% of the market goes to other sectors such as sporting goods, bookbinding, and niche technical applications (Euroleather n.d). These proportions are summarized visually (**Figure 2**), which highlights the dominant role of footwear and the relevance of high-end fashion segments in driving demand for leather.

Although these figures describe the EU leather industry, they reflect general demand dynamics that also apply to integrated tanneries. In Portugal, companies like Derma-Leather stand out for having 95% of their production serving the footwear industry and 5% the leather goods industry (Interview of Mr. Ricardo Fojo 2025). In contrast, Couro Azul currently dedicates its production to the automotive and aviation industries (Jornal de Negócios 2018).

The leather industry serves a broad spectrum of customer profiles, ranging in quality requirements from **standard to high-end segments**. 25% of these customers are in the high-end segment and 34% are in the medium to high segment (Euroleather n.d).

In this context, it is particularly relevant to highlight the **sustained growth of the luxury leather goods sector**. Global revenue from this segment is projected to increase from

approximately $56 billion in 2019 to over $90 billion by 2029 (Statista 2024), reflecting its growing importance as a strategic target for premium tanneries (**Figure 3**).

6.7. Channels

Integrated tanneries use a combination of direct and indirect channels to reach their customers across various markets. One of the **most common methods of direct channels is sales through account managers** (Interview of Mr. Pedro Marques, 2025) who are responsible for coordinating negotiations and aligning technical specifications with the customers specified in the previous section.

A highly relevant sales method in this industry is the **presence at international fairs and exhibitions**, such as Lineapelle in Italy or APLF in Hong Kong (Interview of Mr. Prabu, 2025). These events are key platforms for demonstrating new processes, showcasing products and their prices, and connecting professionals in this sector (Vouzas 2024).

In geographically distant markets, such as Asia or South America, leather companies often work with distributors and agents who act as intermediaries between customers and tanneries (Interview of Mr Titus King, 2025). These partners are responsible for the CRM (Customer Relationship Management), verifying logistical processes, customer service, and compliance with regulatory procedures. Currently, the leather industry is undergoing a digital transformation, **with increasing integration of commercial functions with ERP** (Enterprise Resource Planning) systems, which allow the connection of production data, stock levels, and prices. With these tools, representatives and customers can access all necessary documentation, including invoices, packing lists, labels, and, where applicable, certificates of origin or CITES certification (Magazine Leather 2022).

6.8. Revenue Streams

This type of tanneries, as analysed, has its main source of revenue in the sale of finished leather, typically **priced per square foot and classified by quality, type of tanning, tanning process and finish specifications**. (Interview of Mr. Pedro Marques, 2025; Interview of Mr. Augusto Batista, 2025). As described previously, the sale of the finished product is done in bulk supply agreements for several downstream industries.

One of the most important factors, influencing revenue, is the type of tanning method used when producing finished leather. As stated, before these methods are divided into chrome tanning (producing wet-blue), vegetable tanning and wet-white tanning (Leather Naturally 2023, 29) and the most relevant is Chrome Tanning, accounting for 90% of all leather treatments (Onyuka 2023, 5). Regarding demand, there is an increasing shift towards chrome-free products, such as wet-white or vegetable tanning, in response to environmental and regulatory pressures. When analysing its sustainability, wet-white has lowest environmental results than vegetable tanning (Bacardit and Font, 2020). **In terms of profitability, chrome tanning is the one that presents the best results, since the cost of acquiring chemicals is the lowest** (Interview of Mr. Pedro Marques, 2025).

Another source of income for tanneries are the by-products generated from the treatment of hides. These includes leather scraps, trimmings and collagen-rich waste, which are then sold to various industries (Interview of Mr Carlos Magno, 2025). For example, the **food industry** uses them for gelatine production**,** the **cosmetics sector** for products such as derma filler and skin substitutes, the **pharmaceutical industry** for the creation of capsules for tablets, and the **agricultural sector** to produce fertilizer (Yorgancioglu, Başaran and Sancakli 2020, 12-15).

In terms of **geographic** perspective, revenue sources for integrated tanneries are significantly diversified. Approximately 56% of revenue comes from within the EU-28, highlighting the strength of intra-European trade in the leather sector. An additional 30% derives from non-EU

countries, while 9% originates from China (including Hong Kong), and 5% from the United States (Euroleather n.d.; **Figure 4**).

Within the EU market, which represents the majority of the industry's income, demand is heavily concentrated in countries with **strong fashion and consumer goods sectors**. France and Germany were the largest importers of leather goods in 2017, with values of €4.38 billion and €4.17 billion respectively. They were followed by Italy (€3.23 billion) and the United Kingdom (€3.19 billion), underscoring the importance of these economies as final destinations for leather-based products (APICCAPS 2019; **Figure 5**). These figures support the industry's strategic orientation toward high-value European markets, particularly for companies operating in the premium or sustainable segment.

6.9. Key Partnerships

For raw to finished tanneries, key partnerships are essential to supporting continuous operations, technological development, and regulatory compliance. **One of the most critical areas of interdependence involves the supply of raw hides, which are typically obtained from slaughterhouses and specialized intermediaries**. The sourcing strategy is influenced by the composition of hides used: 80% of EU leather production is based on bovine hides, followed by 19% from sheep and goat, and 1% from exotic leathers (Leather Uk, n.d; **Figure 6**). In companies such as Derma-leather, they only produce leather from bovine hides (Interview of Mr. Pedro Marques, 2025).

Chemical suppliers represent another core group of partners. These suppliers provide tanning agents, dyes, fatliquors, and finishing compounds, all of which must comply with REACH regulations and sustainability frameworks. **Collaboration with chemical partners also supports innovation** in chrome-free processes, bio-based alternatives, and wastewater treatment technologies (Interview of Mr. Celestino Malheiro, 2025).

Tanneries also **maintain long-term relationships with machinery and equipment suppliers**. These partners enable process improvements, automation, and the implementation of energy- or water-saving technologies. In many cases, the relationship includes technical support, training, and equipment customization.

Collaboration with certification and compliance organizations is a standard component of operations. The Leather Working Group (LWG) provides environmental performance assessments, and many clients require certified tanneries to meet procurement criteria. SATRA, a UK-based research and testing center, supplies quality testing, performance verification, and auditing services, especially for leather intended for footwear and automotive use (Interview of Mr. Pedro Moleiro, 2025).

In addition, academic and research partnerships contribute to product innovation, development of alternative tanning methods, and waste reduction strategies. Given that over 40% of revenue is generated outside the EU, partnerships with international logistics providers, distributors, and certification bodies are also central to market access and operational alignment in global export markets such as China and the United States (Euroleather n.d).

7. Strengths and Vulnerabilities of the Integrated Business Model in the Leather Industry

This section explores the internal strengths that contribute to the competitiveness of integrated tanneries, including control over quality, production efficiency, and the ability to respond flexibly to client specifications. At the same time, **structural weaknesses are assessed** that may hinder resilience, such as exposure to raw material price volatility, capital intensity, regulatory compliance burdens, and dependence on downstream industries.

Using a business model perspective, the integrated tanneries' ways of generating and capturing value, manage customer relationships, and adapt to growing demand for sustainability and

traceability are analyzed. Highlighting strengths and vulnerabilities, aims to provide a critical assessment of the strategic positioning of integrated tanneries in a changing global landscape.

7.1. Strengths

One of the most compelling advantages of an integrated tannery model is **full value chain control**. As the model allows for sourcing raw hides at the slaughterhouse to managing finishing operations, tanneries can ensure higher consistency and traceability throughout the product lifecycle (Interview of Pedro Marques, 2025). Such level of control is essential to meet the rising requests and standards for **sustainability demands**, such as those issued by the Leather Working Group (LWG) or ISO 14001 for environmental management. These certifications are no longer optional or recommended but mandatory to work for most brands., making them a mandatory condition to work.

Another key strength lies in the **margins and operational efficiency** that vertical integration enables (Interview of Dr. Augusto Batista, 2025). Without reliance on external suppliers for intermediate stages, integrated tanneries reduce transaction costs and lead times. Furthermore, aligning in-house **R&D with product design requirements** facilitates faster cycles of innovation.

Customer relationships also benefit from integration. Close collaboration with fashion houses, sometimes involving co-development of products, transforms the tannery from a mere supplier into a **strategic partner**.

Integrated models also allow for **brand differentiation**. Whether by producing distinctive leather finishings or by offering customization options as for thickness and colorfastness, firms can build a proprietary edge in the marketplace. Integrated firms often have the flexibility to promote the narrative of tradition, sustainability, and innovation in a way that outsourced or fragmented operations cannot match.

Finally, **environmental compliance and risk management benefit from integration**. By internalizing wastewater treatment and solid waste disposal, integrated tanneries mitigate the risk of dependency on third-party vendors, which may fail to meet legal or ethical standards. One of the core advantages of the integrated model lies in the **customer segments** it enables. By serving a diversified client base, including footwear, fashion accessories, automotive, and interior design, integrated tanneries gain a buffer against sector-specific downturns. Stability in one segment often helps offset declines in another. This diversity also enhances operational adaptability, as each industry imposes different technical standards and regulatory demands. Moreover, collaboration with premium market segments opens opportunities for high-margin sales and reinforces the importance of customization and quality differentiation. The business-to-business (B2B) nature of these relationships supports predictable order flows, long-term contracts, and a structured exchange of technical data.

From the perspective of **channels**, integrated tanneries benefit from a hybrid system that combines direct commercial relationships with digitalized operational tools. Account managers foster strong technical alignment and regular dialogue with clients, particularly those requiring strict compliance and performance guarantees. Participation in international trade fairs such as Lineapelle or APLF contributes to visibility and access to new markets. The integration of ERP systems further supports efficiency by linking logistics, production, and sales, thereby improving responsiveness and documentation.

In terms of **revenue streams**, the model allows for diversification across both industries and geographies. Price structures vary depending on the complexity of finishing, tanning method, and quality requirements, making it possible to tailor offers to different markets. Moreover, the monetization of by-products through sales of fleshings, trimmings, or recovered chemicals not only improves margins but aligns with circular economy principles.

Finally, the **key partnerships** sustained by integrated tanneries are critical to maintaining consistency and adaptability. Collaborations with chemical suppliers and machinery manufacturers provide ongoing technical support and process innovation. Certifications issued by bodies such as the Leather Working Group or SATRA strengthen credibility with clients and regulators. Relationships with academic institutions additionally support long-term R&D and training capacity.

7.2. Vulnerabilities

Despite these advantages, the integrated model also exposes tanneries to several vulnerabilities. First and foremost is the **capital intensity**. The infrastructure required for tanning drums, drying tunnels, finishing machines, chemical storage, and wastewater treatment demands substantial upfront investment. These fixed costs make the business model less flexible and increase break-even thresholds.

A related issue is **operational complexity**. Managing chemical processes, sustainability audits, skilled labor, and logistics across multiple steps of production creates a demanding management environment. Any inefficiency or delay in one segment, e.g., if retanning is held up, can cascade through the entire chain (Interview of Mr. Titus King, 2025).

Another vulnerability arises from **raw material volatility**. Prices for hides and essential chemicals are subject to global market dynamics and can fluctuate widely, affecting margins. Integrated tanneries often commit to long-term sourcing contracts or infrastructure investments that limit their flexibility in response to these changes (Interview of Dr. Augusto Batista, 2025).

Supply chain bottlenecks also emerge from the model. While integration allows for tighter control, it also means firms must handle every step themselves. As noted by multiple industry professionals, sourcing raw materials can take up to 90 days, depending on if it must be shipped (Interviews of Mr. Jimmy Frazão and Mr. Luís Mota, 2025), and production cycles typically span three weeks. This affects lead times and responsiveness to fluctuating demand.

Furthermore, **seasonality in customer orders**, especially from fashion brands with biannual schedules, can make capacity planning difficult (Interview of Mr. Nambi, 2025).

Another critical challenge is **labour specialization**. The tanning process demands artisanal knowledge passed down over generations. As younger workers turn to other professions and educational institutions in tanning remain few (e.g., Leatech, ILT Chennai), there is a growing risk of skill gaps. In a highly integrated model, this human capital shortage can cause critical disruptions.

Certification and regulatory compliance represent another area of strain. While necessary for global competitiveness, maintaining multiple certifications, such as REACH, OEKO-TEX, and LWG, imposes additional administrative and financial burdens. Failure to meet these standards, even if only in a single segment, can undermine the credibility of the entire business.

One of the less obvious but equally important vulnerabilities lies in **public perception and consumer awareness**. For informed B2B clients, certifications and traceability provide reassurance. However, **uninformed end consumers** may conflate all leather production with environmental degradation or animal cruelty. This creates **brand vulnerability**, particularly for integrated tanneries with downstream products. Despite using by-products of the meat industry and meeting rigorous environmental standards, these firms may still be targeted by negative consumer sentiment based on outdated or inaccurate perceptions. A single controversy, whether over slaughterhouse sourcing, water usage, or emissions, can tarnish an otherwise compliant brand.

Furthermore, **integration amplifies reputational risk**. If one part of the operation, such as wastewater treatment or ethical labor compliance, fails, the damage affects the entire brand. In contrast, more fragmented models may deflect responsibility onto third-party vendors, insulating brand reputation to a degree.

Within **customer segments**, many of the industries that rely on leather inputs, fashion, automotive, interiors, are sensitive to macroeconomic volatility, shifting consumer values, and reputational challenges surrounding animal welfare and sustainability. Integrated tanneries have little influence over such downstream developments. Rising demands for traceability and ethical sourcing, particularly in export markets, further pressure companies to ensure upstream transparency that may not be fully within their control.

In **channel strategy**, there are limitations tied to dependence on physical trade fairs and face-to-face meetings. Shocks such as pandemics or geopolitical disruptions can inhibit travel or change how business is conducted. Additionally, many tanneries exhibit low digital maturity. Partial or outdated ERP systems hinder data capture and client responsiveness. Where distribution is managed by intermediaries, especially in remote markets, tanneries risk losing control over brand positioning and customer feedback.

From a **revenue stream** standpoint, vulnerabilities arise from the industry's continued reliance on chrome tanning. While efficient and cost-effective, this method faces growing regulatory and consumer opposition. Alternatives like vegetable tanning or wet-white methods are costlier and may offer lower yields, impacting margins. Concentration risks are also high in sectors like automotive, where a few large contracts dominate income. In such cases, even minor disruptions can have major financial consequences. External factors such as energy price volatility, environmental compliance costs, and raw material fluctuations also limit pricing flexibility.

Regarding **key partnerships**, raw material procurement remains a challenge. Most tanneries source hides via non-integrated channels like slaughterhouses or traders, reducing their control over hide quality, traceability, and animal welfare assurances. Seasonal supply variation and regional shortages exacerbate these constraints. Dependence on a narrow range of chemical or equipment suppliers can create supply bottlenecks and limit negotiation leverage. Similarly,

reliance on third-party distributors may weaken branding efforts and complicate response to end-user expectations.

Finally, **reputational vulnerability** presents a significant challenge. Even when integrated tanneries comply with stringent sustainability and ethical sourcing requirements, they remain susceptible to negative public perception. Uninformed consumers may equate all leather production with environmental harm or animal cruelty, overlooking the use of by-products from the meat industry and circular practices. A single failure, such as wastewater mismanagement or a poor audit result, can damage brand reputation across the integrated value chain. Unlike fragmented models, which may deflect responsibility to suppliers, integration centralizes both performance and blame.

In sum, the integrated business model offers compelling strengths in control, customization, sustainability, and customer alignment. It positions leather producers to compete globally while meeting escalating regulatory and client demands. However, it is also a model that demands robust infrastructure, skilled labor, and stringent compliance protocols. It leaves firms exposed to reputational risks, raw material volatility, and capital intensity challenges. For companies that can master these complexities, integration offers a path to resilience and competitive edge. For others, it may pose as many risks as it does rewards. As consumer expectations evolve and sustainability moves to the forefront, how tanneries manage both perception and performance will define their future in the global leather industry. Success will depend not only on operational excellence but also on proactive communication, strategic partnerships, and the ability to align with evolving societal expectations around sustainability and ethics.

8. Recommendations

8.1. Vertical Integration through Strategic Partnerships with Slaughterhouses for Better Handling of Hides and Traceability

One of the core vulnerabilities identified in the business model of integrated tanneries that operate under a "raw to finish" approach is their **lack of control over the initial stage of the value chain: the acquisition of hides**. While these tanneries oversee the tanning and finishing processes internally, they remain dependent on external slaughterhouses for raw material supply. This disconnect poses **two significant risks**: one concerning the **quality of the hides** and another regarding the **traceability of the leather**. Both are increasingly critical dimensions for competitiveness, compliance, and market access.

The quality of leather is intrinsically linked to the condition in which hides are removed and preserved immediately after the slaughter of animals. When this step is executed improperly, such as through careless flaying or contamination during handling and transport, the resulting **hide can suffer from cuts, bacterial degradation, or salt damage**, all of which diminish the value and utility of the raw material. Tanners often have no direct influence over these practices, as slaughterhouses operate independently and typically prioritize meat production, relegating hide preservation to a secondary concern. Leading meat companies such as JBS are among the few players that also take part in the leather industry with either raw to wet-blue or crust tanneries; however, hides represent only about 3% of their total business (Interview of Mr. Lucas Maciel, 2025). As a result, even when such companies control the tanning process, **hides are not a strategic priority**, and optimization of hide quality is often neglected. For most other meat producers who do not operate their own tanneries, the incentive to properly care for hides is even lower. These firms rarely invest in training or best practices for hide removal because **economic return is minimal compared to their core meat products**.

This lack of alignment between upstream and downstream actors in the leather value chain contributes to **systemic quality inconsistency** and limits the potential for high-end leather production. Given that premium segments of the leather market, such as those supplying luxury fashion or automotive interiors, demand flawless material, this lack of quality assurance at the source represents a strategic vulnerability for tanneries aiming to serve discerning clients.

In parallel, the growing importance of **supply chain transparency** has brought **traceability** to the forefront of regulatory and consumer expectations. The European Union's Deforestation Regulation (EUDR), effective from 2026 (European Commission n.d.), mandates full traceability of leather products down to the farm level. Companies will be required to provide geolocation data to verify that raw materials are not sourced from deforested land. Failure to comply with these requirements will result in restricted market access to the EU, which remains a significant export destination for leather goods.

Luxury brands are already preparing for this new reality. Premium fashion groups such as Gucci, Louis Vuitton, Veja, and Inditex have started demanding full traceability of their leather supply chains (Interview of Mr. Pedro Marques, 2025) to **meet internal ESG commitments and protect brand reputation**. In a recent pilot project, the Mexican tannery PMP partnered with Louis Vuitton to implement full traceability from slaughterhouse to finished product, ensuring that the ecological footprint of the cattle (Interview of Mr. Carlos Magno, 2025), including greenhouse gas emissions, was net zero at the point of slaughter. This case demonstrates how traceability is evolving not only to include origin, but also the sustainability profile of livestock.

Given these quality and traceability challenges, we recommend that integrated tanneries pursue vertical integration of slaughterhouses through strategic partnerships. Rather than acquiring slaughterhouses outright, an option that entails high capital investment and operational complexity, **we propose a more flexible model based on long-term partnerships,**

equity stakes, or joint ventures with selected slaughterhouses. The goal of this integration would be to **create aligned incentives**, **improve operational standards for hide handling**, and **implement traceability systems that extend upstream to the slaughter stage**. This approach allows tanneries to extend their quality and traceability protocols to a critical stage in the value chain without overburdening their core operations.

To operationalize this recommendation, we propose a five-step action plan that offers a structured roadmap for vertical integration between tanneries and slaughterhouses.

Step 1 involves identifying and prioritizing key slaughterhouse partners based on factors such as geographic proximity, processing volume, and ESG (Environmental, Social, and Governance) risk profiles. Tanners should target suppliers with the potential for long-term collaboration and high-quality hide output.

Step 2 consists of establishing formal partnerships through equity stakes, long-term contracts, or joint ventures. These agreements must align incentives to encourage quality improvements and traceability compliance, ensuring mutual benefit and commitment.

Step 3 is the education and sensitization of slaughterhouse operators. After formalizing the partnerships, tanneries should implement training programs to promote best practices in hide removal and preservation. This step is crucial to improving hide quality at the source and ensuring alignment with ethical and environmental standards. Training should be reinforced through structured audits, feedback mechanisms, and incentive systems tied to performance.

Step 4 focuses on the deployment of digital traceability tools. Tanneries should implement technological systems, such as RFID solutions from Avery Dennison or blockchain platforms like TextileGenesis, at the point of slaughter to track each hide's origin and journey through the supply chain. Avery Dennison's RFID technologies are already used by major global retailers such as Walmart (Avery Denninson 2025), demonstrating their scalability and effectiveness in complex supply chains. TextileGenesis, on the other hand, is a pioneering blockchain-based

traceability platform in the textile industry (TextileGenesis 2025), offering a proven model that can be replicated in the leather sector to enhance transparency and credibility. These tools allow for geolocation tagging, data encryption, and integration with global traceability frameworks. Collaborating with certification bodies such as the LWG ensures alignment with best-in-class traceability protocols (Leather Working Group n.d.) and ESG monitoring.

Step 5 is to market the change through a B2B communication strategy. By highlighting their traceability capabilities, tanneries can strengthen contractual relationships, build trust with existing clients, and access traceability-driven procurement opportunities, particularly in regulated or premium markets where sustainability and compliance are core decision factors.

This recommendation represents a **relatively low-cost but high-impact shift** in the existing business model of integrated tanneries. By extending quality control upstream and enabling full traceability, tanneries position themselves as **reliable partners for premium brands and as compliant actors** within tightening regulatory frameworks. In doing so, they transform a current vulnerability into a source of competitive advantage, **aligning their operations** with the future direction of the global leather industry. Importantly, for this transformation to scale across the industry, it is essential that larger market players take the lead, as their influence sets quality and compliance benchmarks that smaller suppliers are likely to follow to maintain access to the same client base and distribution networks.

The **relevance of this strategy may also vary depending on the regional context**. For example, Argentina and India, both among the top five beef-producing countries globally (FAO and USDA 2025; **Figure 7**), offer a favourable environment to implement this type of upstream integration, given the scale of their meat industries and hide availability. In contrast, countries like Portugal, which ranked among the top ten leather importers worldwide in 2016 (3.7% of global imports) (JCR-VIS 2017; **Figure 8**), are more reliant on foreign raw materials, making it more challenging to control upstream operations. In such cases, vertical integration may be

less feasible domestically, and emphasis should instead be placed on building traceable supply partnerships with exporting countries.

8.2. Green Certification as a Method of Educating the Consumer and Promoting Leather as a Sustainable Product

Considering leather is not correctly accessed as an environmentally friendly product it is recommended to promote the truth: **leather as a fully recyclable material**. For this it is proposed to create a certificate that signals **leather as a recycled product**. This certificate would then have **different tiers according to which conditions the leather was made**. There would be a base tier attributed to all products made from leather and then there would be tiers according to **how tanneries manage their wastes**, how they treat or send them to suitable companies that would treat them in a responsible way, and what **type of energy the tanneries use**.

Certifications that promote sustainability and are available to consumers have already been implemented in other industries such as the **home furnishings and furniture retail industry**. In this industry the certification that currently ensures that forests are managed responsibly, respecting environmental, social, and economic standards is the **Forest Stewardship Council**, **FSC**. Companies such as IKEA and Home Depot have adopted FSC-certified wood as part of their sustainability strategies. According to IKEA (2024), 97% of the wood used in their products came from FSC certified reflecting their commitment to sustainability. Home Depot has been a leader in this area since 1994 and has worked closely with suppliers to make certified wood available across various options (The Home Depot 2024). Although direct sales data linked to FSC adoption are not publicly disclosed, IKEA and The Home Depot have reported enhanced brand reputation and increased customer trust as a direct consequence of their sustainability commitments. With such facts stated is more than assured than consumers associate the FSC with ethical sourcing and sustainability. Consequently, it is believed that a

tailored certification system for the leather industry would provide added value to consumers.

As to differ from the current major certification in place for the industry, **LWG**, this certification would not be dependent on local laws and so would be equally enforceable to all companies around the world, even though that the proposed plan presented in the next paragraphs focus on a 1st stage in Europe. For this new green certification to be applied worldwide there are 2 points that are crucial. To understand the 1st point the Apple and EU take on chargers is fundamental. As EU made mandatory for Apple to have the same chargers' entrance as other phones made by their competitors, Apple chose to make all its phones for the same charger dropping its long unique type of charger (Wired 2023; Tech Xplore 2023; BBC News 2023). Such fact serves as the basis for application of this certificate worldwide. As this certificate would be mandatory in shoe boxes and labels this would put the brands with the same options of Apple, create a special product for EU **or getting all their products with the same boxes and labels building on their economies of scale to maximize profits**. It is expected that while posing with a similar problem to Apple brands would choose the same way out. The 2nd point relates to getting the positive effect worldwide and, as it will be stated in the next paragraphs, this initiative can have strong effects on brand loyalty as presented on the furniture industry. This would ensure that **all companies play by the same set of rules**, leveling the field between companies located in countries with stronger legislation and ones in areas that are not so heavily legislated. Besides this the proposed new certification system would **strive for educating consumers** about the truth hidden behind the leather industry and how it is by itself a sustainable and recycling industry instead of staying a B2B tool. By providing a certification that can be easily recalled by consumers there would be stronger motives to push for progress, as well as **keeping the standards high so that it wouldn't lose consumers' trust**.

This certification would serve as an educational tool for consumers and as an official endorsement of the sustainability efforts of tanneries and brands. For the implementation there are several crucial factors:

1. Collaboration with Stakeholders: Engage with municipal and central government authorities, as well as European Union officials, to create a certification program that identifies leather as a natural, recyclable product. This would give **credibility** to the certification as well as making it mandatory to **distinguish leather from other products**.

2. Certification Scope, Criteria and System: The certification should be comprised by a wide range of sustainable practices in leather production. The use of **green energy sources**, the **responsible treatment of effluent water**, either internally or in an external plant that serves a cluster of tanneries, and the **recycling of leather residues** would all be key criteria. On the last point there are several points associated: hair taken from the beamhouse for **fertilizers**, fleshing and fatty tissues for collagen that can then be used in **cosmetics** or in the **food industry**, **chrome recovery** from wet-blue waste to reuse, send chrome and finishing leather wastes to countries where the soil allows chrome to be used in fertilizers (Interview of Mr. Jimmy Frazão, 2025). These aspects would reduce environmental impact while promoting a **circular economy**.

As to make this certification **more accessible** to every tannery and to **reward efforts** there would be a **tiered certification system** like LWG. This would allow for recognition to be handed to tanneries that are not yet top performers regarding sustainability measures but that are investing to meet such criteria, while giving those higher performers a distinction that would incentivize them to keep improving.

3. Long-Term Vision: Over time, the certification would **adapt itself to new technology** advances so that **innovation is fostered and rewarded**. By keeping standards high, the industry is assured to be kept **aligned with global sustainability goals**. Moreover, it will enhance

consumer trust in leather products, positioning the industry as a leader in responsible production.

4. Communication to Consumers: This certification should be clearly **displayed on product packaging** to ensure that the **final consumer is informed about the sustainability of the leather they are purchasing**. To achieve such awareness there would be a need to **include brands** in this plan. They should play an active role in communicating this certification to their customers, either through digital channels, marketing campaigns, or through direct education on product packaging. Brands would be compelled to take part in this as they **would benefit in getting customers to pay an existing premium price or even a larger one rewarding sustainability efforts**. The valuation of this effort differs from report to report per example according to PWC consumer voice survey (PWC 2024) can go up to 9,7%, nevertheless according to Bain & Company (2023) it can go up to 12%. Adding to this SWNS Media Group studies show that 67% of Americans believe that sustainable products should be the standard for any company (New York Post 2024). However, these studies may diverge there is no denying that consumers want more sustainable offers in the market and that at least a part of these are willing to pay an additional fee for products that meet their standards. This premium must be **distributed along the supply chain** so that the tanneries are incentivized to keep their sustainability efforts. However, if brands are to look at the examples of IKEA and The Home Depot present before they can use this opportunity to increase customer loyalty and brand reputation by adopting measures that ensure that their products are made of sustainable products without increasing prices. This presents new **opportunity to distinguish themselves from their competitors and become industry leaders** by setting the tone of what makes a company committed to the environment.

In summary, the certification of leather products as sustainable and recyclable offers significant advantages for both brands and tanneries. Brands leverage the certification to justify premium

pricing, enhance brand loyalty, as well as tapping into the growing market of environmentally conscious consumers. On the other hand, tanneries that adopt these sustainable practices can charge brands more for their certified leather, enabling them to recover the costs of implementing environmentally friendly measures. This mutually beneficial arrangement can **create a cycle of growth**, where brands and tanneries both **enjoy financial rewards while contributing to the overall sustainability of the leather industry**.

9. Conclusion

This thesis set out to explore strategic business models in the leather industry, with particular emphasis on the integrated tannery model, from raw hide acquisition to finished leather production. Through the application of the **Business Model Canvas framework**, combined with qualitative insights from industry practitioners across Europe, South Asia, and South America, this report has uncovered both the **strengths and vulnerabilities of current operational structures** in the leather sector. Furthermore, it provided **recommendations** for adapting these business models to contemporary challenges, including increasing regulatory scrutiny, shifting consumer perceptions, and the need for greater supply chain transparency.

The analysis confirmed **that integrated tanneries benefit from a unique position within the leather value chain by overseeing every stage of production**. This operational control enables better quality assurance, faster response to client needs, and the ability to innovate across processes and product specifications. However, this same integration exposes firms to a series of strategic vulnerabilities, including capital intensity, dependence on external slaughterhouses, and reputational risks stemming from weak consumer awareness of leather's true sustainability credentials. These liabilities become even more relevant in a global context marked by rising expectations for traceability, circularity, and environmental compliance.

As to address these challenges stated in the research questions two vital recommendations are provided: First, promoting upstream integration with slaughterhouses through strategic

partnerships and second, the introduction of a green consumer-facing certification. The latter would tackle issues on quality and traceability of hides while futureproofing the industry of new compliance frameworks such as the EU Deforestation Regulation. The former intends to confront the bad reputation that the industry has and educate the public on leather's true environmental impact as a recycled material.

These recommendations not only aim to mitigate existing vulnerabilities but also to convert them into sources of competitive advantage. **Improving hide handling at the source directly enhances leather quality and production efficiency**. It also enables brands to tell a clearer and more compelling story around their sustainability efforts, something that increasingly determines consumer choices and retailer requirements. Likewise, a green certification would **reposition leather as a modern, circular product, potentially unlocking premium pricing and loyalty among environmentally conscious consumers**.

Overall, the work presented in this thesis reaffirms the relevance of business model thinking as a strategic tool for navigating industrial transformation. By combining a structured analytical framework with field-based insights, we have shown how legacy sectors such as the leather industry can evolve to meet contemporary expectations without abandoning their core strengths. **Rather than positioning sustainability and profitability as competing goals, this report has argued that, in the case of integrated tanneries, they are deeply interdependent**. The leather industry is at a pivotal moment, and companies that embrace this dual imperative are more likely to thrive in a future shaped by transparency, circularity, and informed consumer engagement.

Bibliography

Amit, Raphael, and Christoph Zott. 2001. "Value Creation in E-Business." *Strategic Management Journal* 22 (6–7): 493–520. https://doi.org/10.1002/smj.187

Andreini, Daniela, Cristina Bettinelli, Nicolai J. Foss, and Marco Mismetti. 2022. "Business Model Innovation: A Review of the Process-Based Literature." *Journal of Management and Governance* 26 (4): 1089–1121. https://doi.org/10.1007/s10997-021-09590-w

APICCAPS. 2019. "Value of Leather Goods Imported by European Union Members (28 Countries) in 2017, by Country." In *Statistical Report Footwear Cluster 2018*, 129. Accessed May 7, 2025. https://www.statista.com/statistics/459767/leather-goods-import-value-by-country-eu-europe/.

Aquanena. Águas do Centro Litoral. 2023. *Regulamento do Abastecimento de Água e Saneamento – Concelho de Alcanena*. Accessed May 16, 2025. https://aquanena.pt/kuynb/2023/07/RegAbastAgua-SaneamConcAlc-DR_compressed.pdf.

Avery Dennison. 2025. *Company Overview*. Accessed May 20, 2025. https://www.averydennison.com/en/home.html.

Bacardit, A., F. Combalia, J. Font, and G. Baquero. 2020. "Comparison of the Sustainability of the Vegetable, Wet-White and Chromium Tanning Processes through the Life Cycle Analysis." *Journal of the American Leather Chemists Association* 115 (3): 105–111. Accessed May 14, 2025. https://www.researchgate.net/publication/354637748.

Bain & Company. 2023. "Consumers Say Their Environmental Concerns Are Increasing Due to Extreme Weather—Study Shows They're Willing to Change Behavior, Pay 12% More for Sustainable Products." *Bain & Company*. Accessed May 16, 2025. https://www.bain.com/about/media-center/press-releases/2023/consumers-say-their-environmental-concerns-are-increasing-due-to-extreme-weather-study-shows-theyre-willing-to-change-behavior-pay-12-more-for-sustainable-products/.

Baldua, Ishita. 2020. “The History of Leather.” *Documenting Design (blog)*, August 6, 2020. Accessed May 4, 2025. https://ishitabaldua.wordpress.com/2020/08/06/__trashed/.

Barbe, Josephine. n.d. “The History of Leather Tanning.” *Maharam*. Accessed May 3, 2025. https://www.maharam.com/stories/barbe_the-history-of-leather-tanning.

BBC News. 2023. “Apple’s USB-C iPhone: EU Rules Force Tech Change.” *BBC*, September 5. Accessed May 16, 2025. https://www.bbc.com/news/technology-66708571.

Buljan, Jakov. 2005. “Costs of Tannery Waste Treatment.” 15th Meeting of the UNIDO Leather Panel, León, Mexico, September 10–14. United Nations Industrial Development Organization. Accesed May 13, 2025. https://leatherpanel.org/sites/default/files/publications-attachments/costs_of_tannery_waste_treatment.pdf.

Carl Friedrik. n.d. “What Is Leather Made Out Of?” *Carl Friedrik*. Accessed May 8, 2025. https://www.carlfriedrik.com/int/magazine/what-is-leather-made-out-of.

Carmen. 2024. “Leather in the Middle Ages: Tanning Processes and Leather Articles.” *Battle-Merchant Blog*. June 27, 2024. Accessed May 4, 2025. https://www.battlemerchant.com/en/blog/leather-in-the-middle-ages-tanning-processes-and-leather-articles.

COTANCE. 2023. *Sustainability Progress Report*. Accessed May 11, 2025 https://www.euroleather.com.

CTIC – Centro Tecnológico das Indústrias do Couro. n.d. “História do Curtume.” Accessed May 4, 2025. https://ctic.pt/historia-do-curtume/.

Darlong, Joel Lalengliana. 2019. “Jajmani System in Indian Caste.” *Sociology Lens*. Accessed May 4, 2025. https://www.sociologylens.in/2019/05/jajmani-system-in-indian-caste.html.

de Vartavan, Christian. 2014. “Leather and Skin as Markers of Early Exchanges Between Western Asia and Egypt?” *Journal of Ancient Egyptian Interconnections* 6 (2): 59–61. https://doi.org/10.2458/azu_jaei_v06i2_de_vartavan.

Diário da República. 2000. “Despacho n.º 4186/2000.” *Diário da República Electrónico*. Accesed May 14, 2025. https://diariodarepublica.pt/dr/detalhe/despacho/4186-2000-2436284.

ECHA. 2023. “REACH Regulation.” Accessed May 11, 2025. https://echa.europa.eu/regulations/reach.

Electra. 2023. “Electric Car Consumption – Average Consumption of Popular Electric Vehicles.” *Go Electra*. Accesed May 14, 2025. https://www.go-electra.com/de/newsroom/electric-car-consumption/#Average-consumption-of-popular-electric-vehicles.

Euroleather. n.d. “Statistics.” Accessed May 7, 2025. https://euroleather.com/9-uncategorised/268-statistics.

European Commission. n.d. “Deforestation Regulation Implementation.” *Green Forum*. Accessed May 13, 2025. https://green-forum.ec.europa.eu/deforestation-regulation-implementation_en.

FAO and U.S. Department of Agriculture. 2025. “Leading Beef and Veal Producing Countries Worldwide in 2024 and 2025 (in 1,000 Metric Tons).” *Livestock and Poultry: Worldwide Markets and Trade 2025*, April 2025. Accessed May 17, 2025. https://www.statista.com/statistics/263990/leading-beef-producers-around-the-world-since-2007/.

Fengyang, Jiang, and Aylin Ates. 2017. "Business Model and the Value Theory: A Critical Review of the Literature." Paper presented at the British Academy of Management

Conference, September 5–7, 2017, Warwick Business School, University of Warwick. Accessed April 29, 2025. https://strathprints.strath.ac.uk/60734/

Fielt, Erwin. 2014. "Conceptualising Business Models: Definitions, Frameworks and Classifications." *Journal of Business Models* 1 (1): 85–105. https://www.researchgate.net/publication/273381704

Gassmann, Oliver, Karolin Frankenberger, and Michaela Csik. *The Business Model Navigator: 55 Models That Will Revolutionise Your Business*. Harlow: Pearson Education, 2014.

IKEA. 2024. "Wood We Use." Accessed May 15, 2025. https://www.ikea.com/global/en/our-business/sustainability/wood-we-use/.

JCR-VIS. 2017. "Top Importers of Leather Worldwide." *Leather Industry Sector Update*. Published October 2017. Accessed May 17, 2025. https://www.statista.com/statistics/861350/top-importers-of-leather-worldwide/.

Johnson, Mark W., Clayton M. Christensen, and Henning Kagermann. 2008. "Reinventing Your Business Model." *Harvard Business Review*, December 2008. Accessed April 29, 2025. https://hbr.org/2008/12/reinventing-your-business-model.

Jornal de Negócios. 2018. "Couro Azul investe 10 milhões euros no reforço da capacidade produtiva." *Jornal de Negócios*, November 16, 2018. Accessed May 17, 2025. https://www.jornaldenegocios.pt/empresas/industria/detalhe/couro-azul-investe-10-milhoes-euros-no-reforco-da-capacidade-produtiva.

Lazri, M., F. Rigal, J. M. Hutson, L. T. Humphrey, A. Bouzouggar, and J. J. Hublin. 2021. "Bone Tools Used for Leather and Fur Working Found in the Middle Stone Age Levels at Contrebandiers Cave, Morocco." *iScience* 24 (10). Accessed May 3, 2025. https://www.sciencedirect.com/science/article/pii/S2589004221009561.

Leather & Cotton London. 2019. "Just Why Is Portugal Well Known for Its Leather Craftsmanship?" *Leather & Cotton London Blog*. Accessed May 4, 2025.

https://www.leatherandcottonlondon.london/2019/07/fashion-feature-just-why-is-portugal-well-known-for-its-leather-craftmanship/.

Leather Dictionary. n.d. “Chrome Tanned.” *Leather Dictionary*. Accessed May 8, 2025. https://www.leatherdictionary.com/index.php/Chrome_tanned.

Leather Naturally. 2023. *Modern Cow Leather Processing*. February 2023. Accessed May 13, 2025. https://www.leathernaturally.org/wp-content/uploads/2023/02/LN-MODERN-COW-LEATHER-PROCESSING-OFFICIAL-1028.pdf.

Leather Naturally. 2023. *Leather and the Consumer: Research Report.* Accessed May 16, 2025. https://www.leathernaturally.org/wp-content/uploads/2023/03/Leather_and_the_Consumer_WEB.pdf.

Leather Naturally. 2023a. “Innovation and Trends Report.” Accessed May 9, 2025. https://www.leathernaturally.org.

Leather UK. n.d. “Information.” Accessed May 13, 2025. https://leatheruk.org/leather-trade/information/.

Leather UK. n.d. “Would It Really Be Better to Let Hides Rot Than Turn Them into Leather? No.” Accessed May 8, 2025. https://leatheruk.org/would-it-really-be-better-to-let-hides-rot-than-turn-them-into-leather-no/.

Leather Working Group. n.d. “Search Results for ‘Vegetable Tanning’.” Accessed May 16, 2025. https://www.leatherworkinggroup.com/search/?tx_kesearch_pi1%5Bsword%5D=vegetable%20tanning.

Leather Working Group. n.d. “Traceability.” Accessed May 15, 2025. https://www.leatherworkinggroup.com/our-impact/traceability/#:~:text=It%20is%20planned%20for%20traceability,to%20the%20leather%20manufacturer%20standard.

Magazine Leather. 2022. “Digital Transformation Effects of the Leather Industry.” *Magazine Leather*, December 12, 2022. Accessed May 14, 2025. https://www.magazineleather.com/digital-transformation-effects-of-the-leather-industry/.

Magretta, Joan. “Why Business Models Matter.” *Harvard Business Review*, May 2002. Accessed April 28, 2025. https://hbr.org/2002/05/why-business-models-matter.

Morgan, Stuart. 2020. “The Ancient Art of Leather Production.” *SATRA Bulletin*, 2020. Accessed May 7, 2025. https://www.satra.com/bulletin/article.php?id=2576.

New York Post. 2024. “Sustainability Should Be Default for Companies, Most Americans Believe.” *New York Post*, July 3. Accessed May 15, 2025. https://nypost.com/2024/07/03/lifestyle/sustainability-should-be-default-for-companies-most-americans-believe/.

Onyuka, Arthur. 2023. *Wet White Leather as Eco-Friendly Option for the Leather Industry*. Geneva: United Nations Conference on Trade and Development (UNCTAD). August 2023. Accessed May 14, 2025. https://unctad.org/system/files/non-official-document/ditc-ted-19072023-smep-tannery-ARTHUR_ONYUKA-1.pdf.

Osterwalder, Alexander, and Yves Pigneur. 2010. *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. Hoboken, NJ: John Wiley & Sons.

Osterwalder, Alexander, Yves Pigneur, and Christopher L. Tucci. 2005. “Clarifying Business Models: Origins, Present, and Future of the Concept.” *Communications of the Association for Information Systems* 16 (1): 1–25. https://doi.org/10.17705/1CAIS.01601

Perić, Marko, Jelena Djurkin, and Vanja Vitezić. 2017. “The Constructs of a Business Model Redefined: A Half-Century Journey.” *SAGE Open* 7 (3): 1–13. https://doi.org/10.1177/2158244017733516

Philippine News Agency. 2024. “400,000-Year-Old Tools Reveal Early Human Adaptation to Changing Prey.” *Philippine News Agency*, April 30, 2024. Accessed May 3, 2025. https://www.pna.gov.ph/articles/1226172

PwC. 2024. “2024 Voice of the Consumer Survey.” Accessed May 13, 2025. https://www.pwc.com/gx/en/news-room/press-releases/2024/pwc-2024-voice-of-consumer-survey.html.

PWC. 2024. “PwC 2024 Voice of the Consumer Survey.” *PricewaterhouseCoopers*. Accessed May 16, 2025. https://www.pwc.com/gx/en/news-room/press-releases/2024/pwc-2024-voice-of-consumer-survey.html.

Ravilious, Kate. 2010. “World’s Oldest Leather Shoe Found—Stunningly Preserved.” *National Geographic*, June 11, 2010. Accessed May 3, 2025. https://www.nationalgeographic.com/culture/article/100609-worlds-oldest-leather-shoe-armenia-science.

Richardson, James. 2008. "The Business Model: An Integrative Framework for Strategy Execution." *Strategic Change* 17 (5–6): 133–144. https://doi.org/10.1002/jsc.821.

Riello, Giorgio. 2006. “Nature, Production and Regulation in Eighteenth-Century Britain and France: The Case of the Leather Industry.” *Historical Research* 79 (205): 362–388. https://wrap.warwick.ac.uk/62598/

Shafer, Scott M., H. Jeff Smith, and Jane C. Linder. 2005. "The Power of Business Models." *Business Horizons* 48 (3): 199–207. https://doi.org/10.1016/j.bushor.2004.10.014.

Sharma, Mukesh Kumar. 2018. “Opportunities & Challenges in Leather Manufacturing Industry: A Short Review.” *International Journal of Science and Research (IJSR)* 7 (12): 1619–1623. https://dx.doi.org/10.21275/SR181208121506.

Smit & Zoon Wet-End. n.d. “Retanning Leather.” Accessed May 4, 2025. https://www.smitwet-end.com/retanning-leather/.

Soohyo Kim and Choyeon Kim. 2024. “Enhancing Logistics Performance through Increased Trust and Collaboration in Supply Chain Risk Management: A Focus on the Distribution Network of Manufacturing Companies.” *Systems* 12 (4): 141. Accessed May 16, 2025. https://doi.org/10.3390/systems12040141.

Statista. 2024. “Revenue of the Luxury Leather Goods Industry Worldwide 2019–2029 (in Million U.S. Dollars).” *Statista Consumer Market Insights*. October 2024. Accessed May 14, 2025. https://www.statista.com/statistics/1294626/global-personal-luxury-leather-goods-market-value/.

Tech Xplore. 2023. “Apple Complies with EU Mandate, Unveils iPhone with USB-C.” Tech Xplore, September. Accessed May 16, 2025. Tech Xplore. 2023. “Apple Complies with EU Mandate, Unveils iPhone with USB-C.” Tech Xplore, September. https://techxplore.com/news/2023-09-apple-eu-unveils-iphone-usb-c.html.

Teece, David J. 2010. “Business Models, Business Strategy and Innovation.” *Long Range Planning* 43 (2–3): 172–194. https://doi.org/10.1016/j.lrp.2009.07.003

TextileGenesis. 2025. *Home*. Accessed May 20, 2025. https://textilegenesis.com/.

The Home Depot. 2024. *THD Sustainable Forestry Report – January 2024*. Accessed May 15, 2025. Accessed May 16, 2025. https://corporate.homedepot.com/sites/default/files/2024-01/THD%20Sustainable%20Forestry%20Report%20-%20January%202024.pdf.

Thomson, Roy, and Quita Mould, eds. 2011. *Leather Tanneries: The Archaeological Evidence*. Oxford: Archetype Publications.

Timmers, Paul. 1998. “Business Models for Electronic Markets.” *Electronic Markets* 8 (2): 3–8. https://doi.org/10.1080/10196789800000016

United Nations Industrial Development Organization (UNIDO). 2010. *Future Trends in the World Leather and Leather Products Industry and Trade*. Accessed May 4, 2025.

https://leatherpanel.org/sites/default/files/publications-attachments/future_trends_in_the_world_leather_and_leather_products_industry_and_trade.pdf.

Vouzas, Marion. 2024. “Lineapelle International Exhibition Leather.” *Marion Vouzas Blog*, September 28, 2024. Accessed May 14, 2025. https://www.marionvouzas.com/blog/lineapelle-international-exhibition-leather.

Watson, Andrew, and Jim Clifford. 2014. “Mapping Supply Chains for 19th Century Leather.” *NiCHE – Network in Canadian History & Environment*, August 11, 2014. Accessed May 4, 2025. https://niche-canada.org/2014/08/11/mapping-19th-century-leathers-supply-chains/.

Wired. 2023. “Apple’s USB-C iPhone Is Just the Beginning.” Wired. Accessed May 16, 2025. https://www.wired.com/story/apple-iphone-15-usb-c/.

Wisdom Library. n.d. “Carman.” Accessed May 7, 2025. https://www.wisdomlib.org/definition/carman.

Yorgancioglu, Ali, Bahri Başaran, and Aykut Sancakli. 2020. “Value Addition to Leather Industry Wastes and By-Products: Hydrolyzed Collagen and Collagen Peptides.” In *Waste in Textile and Leather Sectors*, edited by Ayşegül Körlü, 1–26. London: IntechOpen. https://doi.org/10.5772/intechopen.92699.

Zott, Christoph, Raphael Amit, and Lorenzo Massa. 2011. “The Business Model: Recent Developments and Future Research.” *Academy of Management Annals* 6 (1): 101–133. https://doi.org/10.1177/0149206311406265.

Appendix

Annex A: Effluent Treatment Process in the Leather Industry

As for the readers to better understand the process of treating effluents that come from tanneries it was decided to present one of the most common, if not the most common process in the industry. This information was taken from the interview of Cíntia Chaul, an Argentinian a Chemical Engineer that is currently the Wastewater Plant Director at JBS Argentina.

1. Chrome Removal Process

The first stage of this plant is to take out the chrome from the tanning water that comes from the tanning drums. For this the pH must be adjusted so that chrome oxide can be transformed into hydroxide of chrome, a molecule that precipitates. To the effluent is added a flocculation agent for the molecules to aggregate. After, the effluent goes through a *pressing filter* in which the flocculated product will be separated from the rest. For this residue there's no current sustainable solution available, so tanneries are forced to pay to bury it in sanitary landfill places defined by the government. This ensures that chrome is not mixed with any other effluent.

2. Treatment of Beamhouse Effluent

Regarding the water that comes from the beamhouse processes as well as any other water prevenient from the tannery. The water prevenient from the beamhouse drums is the water that has more residues, such as faeces, natural oils, and remaining hair. Due to all of these this water has high level of *Chemical Oxygen Demand* (COD), the amount of oxygen required to chemically oxidize organic matter in water, *Biological Oxygen Demand* (BOD), measures the amount of dissolved oxygen that microorganisms need to break down organic matter in water over a specific period, high levels of Sulphurs (S) and Nitrogen (N). The higher levels of COD and BOD the higher the depletion of oxygen in the water which in turn hurts aquatic life. The first step to treat the effluent that comes from the beamhouse processes is to eliminate *Hydrogen Sulfide* (H_2S). Such is executed in stages, a first in which a small proportion of oxygen is injected in the water and a second were the effluent goes to an oxidation tank. This must be done not only to treat the water but also to ensure that the aerobic bacteria in the next stages of the plant are well protected. After mixing the oxygen from the 1st intake, it then goes to the *oxidation tank* where Oxygen is added as well as catalyst so that the reaction of oxidation is faster. With this process is completed the treatment of H_2S by passing it to Sulfates (SO_4^{2-}). The effluent enters with around 2000 ppm of H_2S and goes out with less than 16 ppm. This process takes at least 12 hours depending on how much H_2S is the residual water. Such a timely process has a major energetic cost. If there's a need to make it faster instead of using air to oxygenate the effluent oxygenated water (H_2O_2) is used, due to its high oxidative power. This is only used in very punctual situations due to its higher cost. Once this is completed the effluent is sent to a *Flotation-decantation unit* in which a 3 phases separation occurs. At the bottom remains the solids due to their density, in the middle-clarified liquid and finally on top the oils and solids, such as hair, that have lower density. The external parts are removed and later go to a *centrifuge*, as it will be mentioned.

3. Waste Minimization and Chemical Reactions

After these treatments the effluents streams come together as what had to be taken care separately, the Chrome and Hydroxide Sulphide, is through. With the effluent streams there's one more to join the water of "domestic" use one with little importance in this context. The first point to be made is the need to take out all the remaining solids. It starts with taking out the bigger ones with various filters such as screw conveyor filters. This is important to clean the water stream in the obvious sense, but it will also help the future chemical reactions to clean the effluent. As to get a better yield the contact position between the chemicals that are added and the polluters present in the water will be better, this is there will be more contact between the chemicals that are conjured to react. Therefore, the quantity of reagent added will be less (cost effective measure). The effluent gets pumped (important to scale with a safety factor) to rotative filters that take out the smaller solids and oils (oil doesn´t mix with water). It is followed by Flototation-decantation unit to create a deposit of even thinner solids, molecules. After obtaining a certain volume of the solids defined by the size of the unit it goes to a *homogenization tank* in which air is injected. This helps the homogenization process and prevents H_2S to re-appear. This tank must also be designed with a high safety factor in case there's a need to fix something else in the plant without stopping the production. Following this it goes to a flocculator where a polymer is added. The *pH* must then be adjusted to a pH between 6 and 8, so that the bacteria used in forthcoming treatments don't die. Then goes to a *primary sedimentation tank* in which the last solids are taken out from the effluent. All the solids and oils that were taken out from the effluent go to a *centrifuge* to separate the liquid from the rest. The liquid goes back to the mix of waters referred in this paragraph.

4. Biological Treatment Stages

The effluent follows to a process of biological digestion through bacteria. In the 1st tank is for aerobic reactions where oxygen or air, depending on the level in the effluent, are injected. Temperature and pH are also controlled. The bacteria get the COD and BOD to lower levels.

This mixture is then pumped to a 2nd tank where anaerobic reactions take place. As the bacteria do not have access to oxygen, they must decompose Nitrates (NO_3^-). N stays as gas and goes to the atmosphere. This process takes up to 3 days and the effluent recirculates between the 2 tanks constantly as the bacteria can't go much time in an anaerobic environment.

5. Final Treatment and Disinfection

Once the biological treatment is complete, the effluent is passed through a centrifuge where the bacteria are separated from the liquid and go back to the biological system. Around 80% of the bacteria go back. As a last step before it can go back to nature or is reused in the tannery the effluent is treated with Chlorine to disinfect.

Tab1e 1: Abbreviations

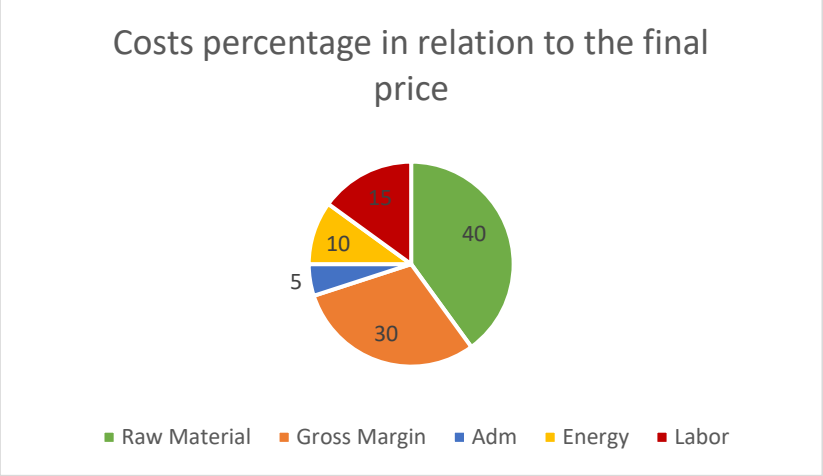
Abbreviation	Definition
BASIFICATION	Process where pH is raised to fix chrome into collagen fibers
BATING	Enzymatic process that cleans and softens hides after liming
BMC	Business Model Canvas
BOD	Biological Oxygen Demand – oxygen used by microbes to decompose organic matter
CFO	Chief Financial Officer
Chemical Term	Definition
CHLORINE	Explanation not found
CHROME	Short for chromium salts, used in tanning to stabilize leather
CHROMIUM	A chemical element (Cr), typically used in tanning as chromium sulfate
CITES	Explanation not found
COD	Chemical Oxygen Demand – measure of oxygen required to oxidize organic matter in water
COLLAGEN	Main structural protein in hides and skin, stabilized in the tanning process
DEGREASING	Step to remove natural fats and oils from hides before tanning
DELIMING	Neutralization step to remove lime and prepare pH for tanning
ERP	Enterprise Resource Planning

EU	European Union
FIXATION	Final step in chrome tanning where chromium is bonded permanently to the hide
H2O2	Hydrogen peroxide, used in some oxidative tanning processes
H2S	Hydrogen sulfide, a toxic gas sometimes emitted from waste decomposition
HYDROXIDE	Explanation not found
ILO	Explanation not found
ISO	International Organization for Standardization
ISO 14001	International standard for environmental management systems
LIME	Calcium hydroxide used to swell and clean hides in the beamhouse stage
LWG	Leather Working Group – sets environmental standards for tanneries
NEUTRALIZATION	Adjusting pH to allow even chemical penetration during retanning
OEM	Original Equipment Manufacturer
PH	Explanation not found
PICKEL	Acidification step in chrome tanning to prepare hides for chrome penetration
REACH	EU regulation on chemicals – Registration, Evaluation, Authorisation and Restriction of Chemicals
SDG	Sustainable Development Goals
SULFIDE	Explanation not found
TANNING AGENTS	Substances like chromium salts or vegetable tannins that stabilize collagen
UK	United Kingdom
UNIDO	United Nations Industrial Development Organization
USD	United States of America Dollar
VEGETABLE TANNING	Tanning method using natural tannins from plants like oak or quebracho
WET-WHITE	Chrome-free tanning method often based on aldehydes or other synthetics

Table 2: Interviews List

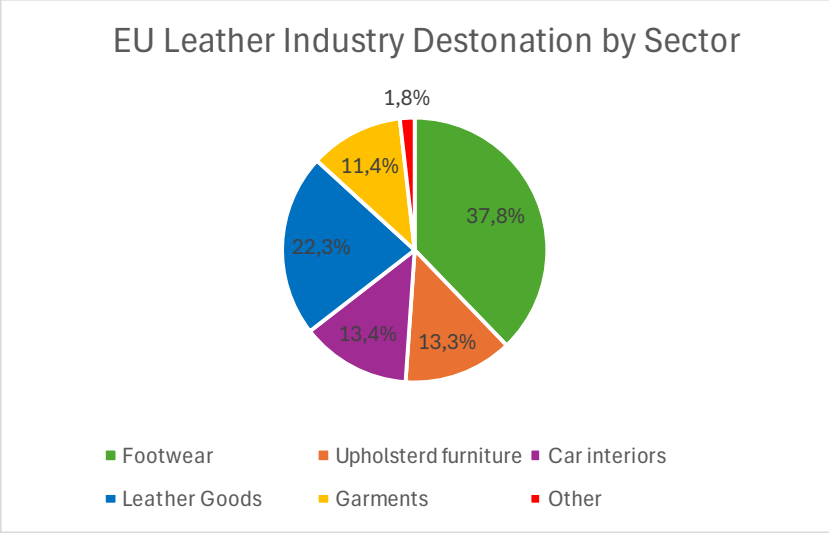
Name	Nacionatlity	Company	Position	Sector
Alfredo Crispim	Portuguese	Consultant	--	--
Augusto Batista	Portuguese	Derma-Leather	CFO	Wet-Blue to Finished
Bruno Parreira	Portuguese	TFL	Wet-End Techinician	Chemical Company
Carlos Magno	Mexican	PMP	Owner	Raw to Wet-Blue
Celestino Malheiro	Portuguese	Leatex	Owner	Chemical Supplier
Cintia Chaul	Argentinian	JBS Argentina	Wastewater Plant Director	Raw to Crust
Federico Biagioni	Italian	Stahl	Retanning Technician	Chemical Company
Federico Lievendag	Argentinian	Surpiel	Owner	Trader
Gerry Lievendag	Argentinian	Surpiel	Owner	Trader
Jimmy Frazão	Portuguese	Lamifil	Owner	Trader
Lucas Maciel	Brazilian	JBS Argentina	Director	Raw to Crust
Luís Mota	Portuguese	Importe	Owner	Trader
Mauro Selmi	Italian	Derma-Leather and Demoscore	Technical Director	Raw to Finished
Nambi	Indian	Cole Haan	Leather Procurement	Shoes Brand
Nuno Rebelo	Portuguese	Miguel Oliveira e Sucessores	Director and Wet-End Techinician	Chemical Company
Pedro Marques	Portuguese	Derma-Leather and Demoscore	Owner	Raw to Finished
Pedro Moleiro	Portuguese	Leather Lab	Director	Laboratory Analysis
Prabu	Indian	Derma-Leather India	Retanning Technician	Wet-Blue to Finished
Ricardo Fojo	Portuguese	Demoscore	Wet End Manager	Raw to Finished
Titus King	Indian	Derma-Leather India	Director	Wet-Blue to Finished

Figure 1: Distribution of Costs in the Final Price of Leather for a European tannery



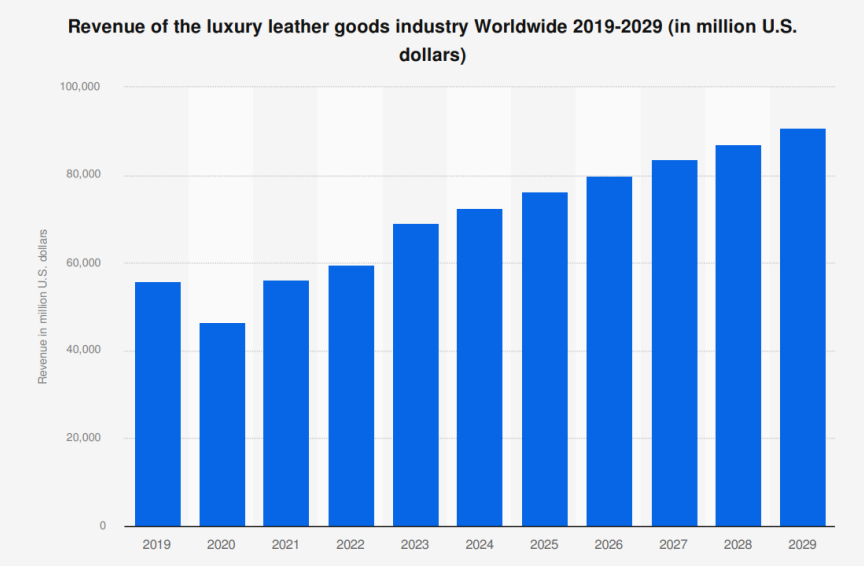
Source: Own illustration based on Dr. Augusto Batista interview.

Figure 2: **EU Leather Industry Destination by Sector**



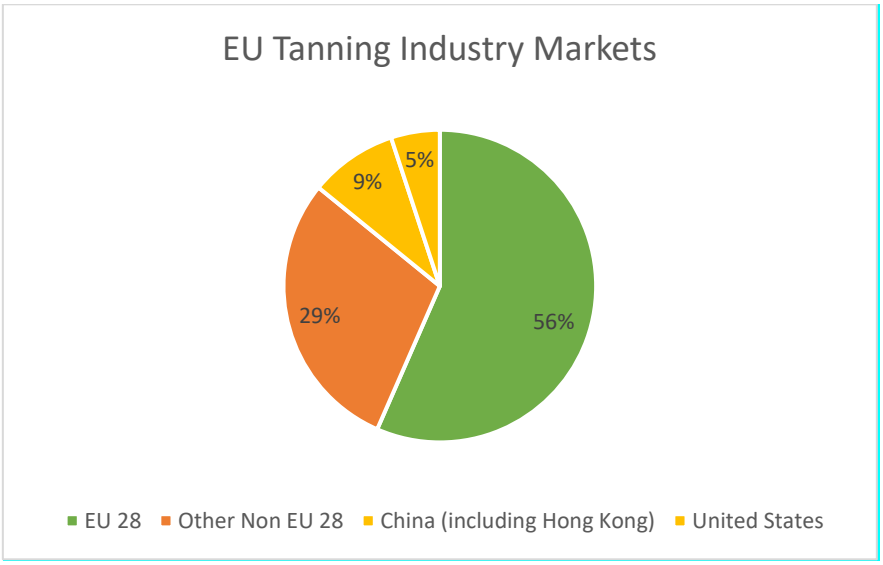
Source: Own illustration based on Euroleather. N.d

Figure 3: **Revenue of the Luxury leather goods industry Worldwide 2019-2029**



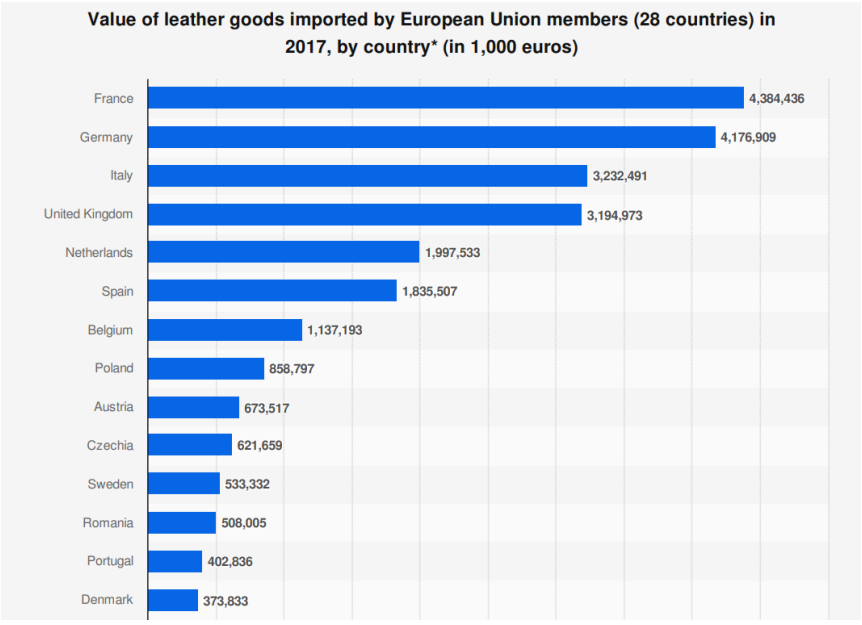
Source: Statista. 2024.

Figure 4: **EU Tanning Industry Markets**



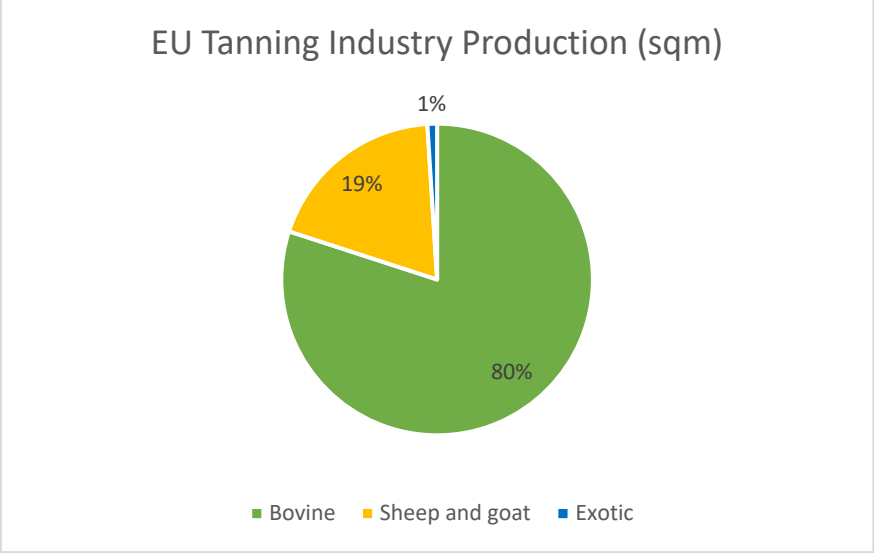
Source: Own illustration based on Euroleather. N.d

Figure 5: **Value of Leather Goods imported by EU Members in 2017**



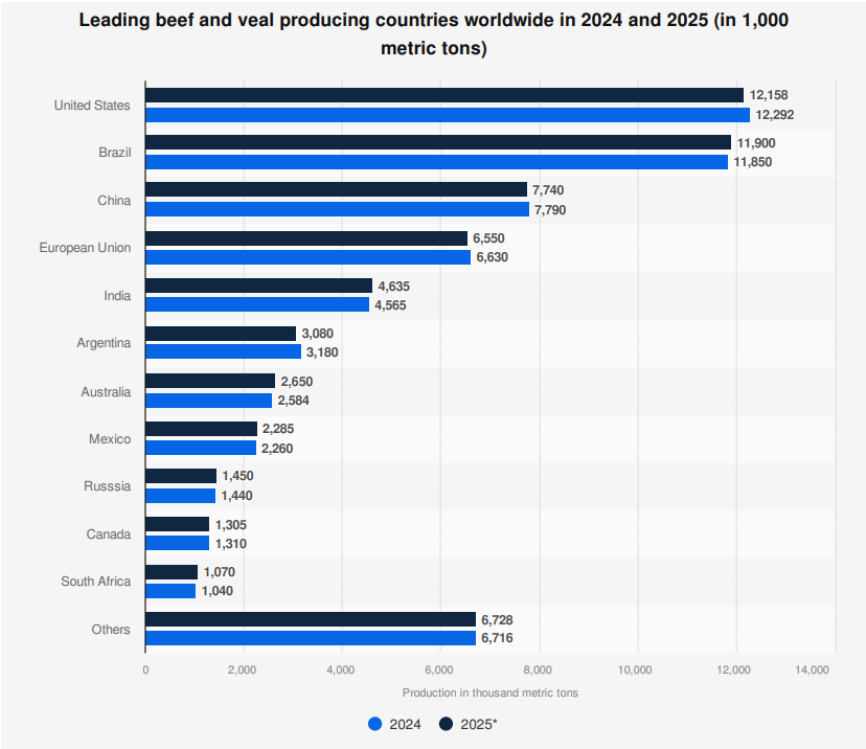
Source: APICCAPS. 2019

Figure 6: **EU Tanning Industry Production (sqm)**



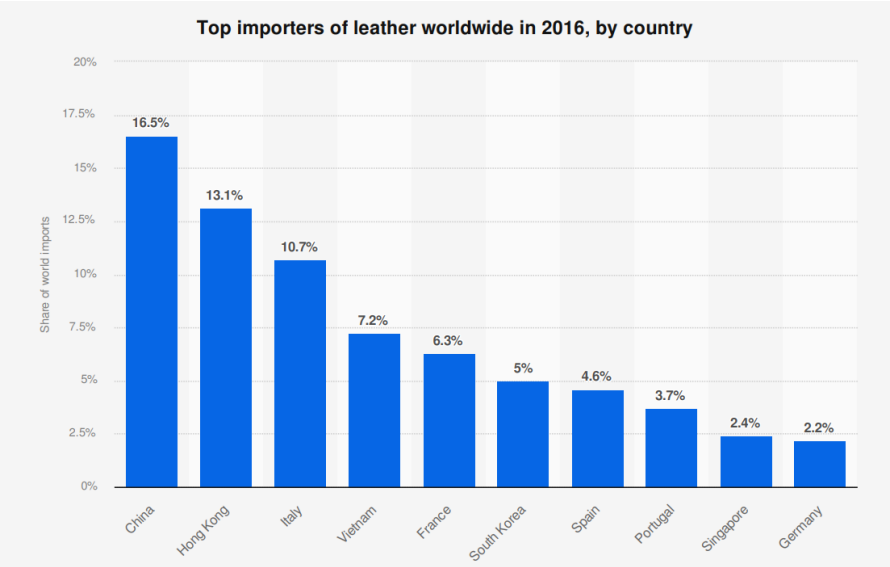
Source: Own illustration based on Euroleather. N.d

Figure 7: **Leading beef and veal production countries worldwide in 2024 and 2025**



Source: FAO and U.S. Department of Agriculture. 2025.

Figure 8: **Top Importers of Leather Worlwide in 2016, by country**



Source: JCR-VIS.2017.