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Management

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Artificial Intelligence in The Fashion Luxury Industry : A Qualitative Analysis of its Use in Optimising Operations

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INTRODUCTION

Artificial intelligence is becoming part of the way we conduct business in every sector and the fashion industry can be no exception. In the luxury world of fashion, challenges are the order of the day and dynamism is its very nature; so how could this world not enter and win in this global challenge?

Studies show how artificial intelligence may be able to reduce errors and speed up the process of delivering products to market through automated warehouse management. Furthermore, with the possible integration of AI, decisions in the fashion industry can be implemented quickly and efficiently, leading to fully planned processes without significant cost and pollution. This would favour a more sustainable and customer-centric approach, aligning operations with consumer preferences and environmental considerations.

This new scenario could produce major changes within the luxury fashion industry, as even major fashion brands will have to review their organisational models and their communication and business strategies.

In particular, in today's society, luxury is no longer an elitist sector reserved for a select few, but something that can be purchased by anyone who feels the need or desire for it. Over the years, therefore, we have witnessed a sort of democratisation of luxury that has also led to an increase in competition between the brands in the sector themselves, which are called upon to innovate and implement actions aimed at attracting consumers. These challenges highlight the need for a strategy that incorporates operational flexibility and artificial intelligence, enabling luxury brands to successfully manage the complexities of a global supply chain, meet customer demands for customised and high-quality products and overcome the difficulties of combining luxury and sustainability.

Although the literature demonstrates and highlights the potential benefits of AI in improving operational efficiency and sustainability, there is little empirical evidence or case studies detailing implementation strategies, outcomes and consumer response to such initiatives in the luxury sector. This gap highlights the need for an in-depth

analysis on the practical application of AI in aligning luxury brands' operations with sustainability goals, taking into account unique market dynamics, consumer expectations and the luxury value proposition.

For this reason, it was decided to conduct a qualitative study with targeted interviews with leading industry representatives. The qualitative analysis method of this study is based on an in-depth analysis of the testimonies collected from two management figures of Kering eyewear: Daniel Bellini, IT & Planning Manager, and Barbara Lissi, Head of Supply Chain, Manufactoring, Innovation & Sustainability. Their personal experience and opinions on the use of artificial intelligence allowed them to collect detailed data on the challenges and opportunities related to the implementation of artificial intelligence in the business processes of a company operating in the luxury fashion industry.

The study asks the question: 'How can artificial intelligence support decision-making processes to optimise operations in fashion-luxury companies from a sustainable perspective?'

The aim of my research is to explore how artificial intelligence can support, or even in the future replace, managerial decisions to optimise production processes, from a sustainability perspective, in companies in the fashion-luxury sector.

CHAPTER 1

A DEEP DIVE INTO THE LUXURY FASHION INDUSTRY

The luxury fashion industry, a world in which creativity meets craftsmanship, is an emblem of aspiration and exclusivity. In particular its luxury segment is a testament to the enduring appeal of opulence.

Originating from the Latin word 'luxus', which conveys notions of excess and superfluity, the concept of luxury has transcended its simple association with material wealth embodying a spectrum of meanings from an ostentatious display of wealth to a more nuanced pursuit of quality and personal gratification[1]. However, the notion of luxury is not static; it varies significantly across different societies and historical periods, often bearing both positive and negative connotations.

In ancient civilizations, luxury was a topic of philosophical debate and social contention. In ancient Greece, for instance, luxury was frequently debated among philosophers, between those who viewed it as an aspirational and beneficial force in society, and those who considered it as a threat to moral virtue and societal harmony. These different views on luxury didn't just influence behavior but were also the reason for different conflicts that came to light within these societies. Moreover, luxury is a versatile phenomenon that can either give opportunities or threats and for this reason it can be perceived as virtuous or vicious.[2]

Particularly, the fashion industry can demonstrate a strong bond to luxury, a relationship that has strengthened. Despite this, the attraction to luxurious fashion remains while developing together with society's changes.[3]

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1 Potavanich, T. (2015). The concept of luxury from a consumer culture perspective. *University of Manchester*.

2 Turunen, L. L. M., & Turunen, L. L. M. (2018). Concept of luxury through the lens of history. *Interpretations of Luxury: Exploring the Consumer Perspective*, 13-29.

3 Cabigiosu, A., & Cabigiosu, A. (2020). An overview of the luxury fashion industry. *Digitalization in the luxury fashion industry: Strategic branding for Millennial consumers*, 9-31.

1. Historical Context and Evolution

The concept of luxury fashion has its roots in ancient civilizations, where clothing and accessories served as indicators of social status and wealth.

Over the centuries, the perception of luxury has undergone a significant shift in perception. Initially associated with excess, opulence, and even moral decadence, luxury was often criticized for encouraging avarice and socially divisive behaviour. Despite this, the attraction to luxurious fashion remains while developing together with society's changes. The term "luxury" has been in use since the 14th century, and initially, was used in the context of clothing experimentation and personal adornment from its earliest uses.

Back when sumptuary legislations prevailed in European countries like Italy, Britain and Greece, clothing was a way to define social classes while preventing light-hearted spending. Statuary laws restricted the use of some fabrics or colours to the nobility, thus making fashion and status connected.

These laws were created to limit consumption linked to the ostentation of luxury and, regulate certain social groups' clothing by forcing them to wear distinctive signs, meaning that in this way they would discourage extravagance while at the same time highlighting status.[4] However, in present-day society, luxury can be seen as a natural outcome of structural changes that give the power to acquire and display.[5]

Initially, luxury fashion found its epitome in haute couture, marking a shift towards luxury as a creative industry. This transition also saw luxury shed its negative connotations and evolve into a symbol of elegance and opulence [6].

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4 Apple, L., Southward, L., & Bickle, M. (2018). LUXURY THROUGHOUT HISTORY: AN EVALUATION OF THE INDUSTRY. *THE FUTURE OF LUXURY*, 8.
5 Taplin, I.M. (2019). The Evolution of Luxury (1st ed.). Routledge.
6 Cabigiosu, A., & Cabigiosu, A. (2020). An overview of the luxury fashion industry. *Digitalization in the luxury fashion industry: Strategic branding for Millennial consumers*, 9-31.

The term 'haute couture' came to birth in Paris, where designers were commissioned by aristocracy and high society to create tailored clothes. This period can truly define the transformation of fashion as a form of art and luxury service. The luxury fashion industry, underwent a form of democratization as a result of the Industrial Revolution and the beginning of ready-to-wear, which led to the increase of luxury merchandise accessible to a wider public. The exposure of modernity and the Industrial Revolution radically changed the concept of luxury and it's approach. Industrialization led to increased productivity and mass production of standardized goods, laying the foundations for today's global luxury industry.[7]

The second half of the 20th century saw the rise of designer brands that expanded their product lines beyond clothing to accessories, leather goods, and perfumes, well and truly becoming luxury houses. Moreover, with the expansion of brands into the emerging markets of Asia and the Middle East, the luxury fashion industry has become truly global. Mergers and acquisitions have become strategic moves for companies seeking to improve their competitive advantage and address the complexities of a global market.

The essence of luxury, once steeped in excess and wealth, is now intertwined with a complex matrix of cultural meanings, social identity, and evolving economic vitality. Indeed the contemporary definition of luxury begins to emphasize the emotional aspects of luxury experiences rather than simply the tangible goods themselves.[8] This new definition of luxury is centred around the emotional connections it creates and the sense of self-identity, satisfaction, and confidence that it fosters.

It shows a more thorough understanding of luxury that encloses both the physical and the intangible elements of the experience.[9]

In addition, technological advances and shifting consumer values towards inclusion and sustainability are challenging the luxury fashion industry. The contemporary luxury market is characterized by a blend of tradition and innovation, where brands face the

7 Apple, L., Southward, L., & Bickle, M. (2018). LUXURY THROUGHOUT HISTORY: AN EVALUATION OF THE INDUSTRY. *THE FUTURE OF LUXURY*, 8.
8 KAYA, Ö. Ü. Ö. THE CHANGE OF THE PERCEPTION OF LUXURY IN FASHION.
9 A brief history of luxury. Truly Experiences. Retrieved March 13, 2024, from https://trulyexperiences.com/blog/brief-history-luxury/

challenges of maintaining exclusivity while expanding their reach and adapting to the digital era.

As the luxury sector has become accessible to a wider public over the years, competition between brands has increased. To alter themselves and draw the public, luxury brands needed to innovate and provide distinctive experiences with great figurative value[10].

However, providing such experiences to online consumers has been a challenge due to the lower level of engagement in virtual environments. Fortunately, there are now several technologies available, such as artificial intelligence, virtual and augmented reality, and the metaverse, that can make the online shopping experience more realistic and exciting. Luxury brands have started to incorporate these technologies into their marketing strategies with positive results in terms of sales, brand loyalty, and brand consideration. Nevertheless, there is still limited research on which technological elements and digital marketing strategies can create memorable and meaningful experiences among luxury consumers.

The impact of celebrities and mass media on the perception of luxury merchandise is a noteworthy topic. The acquisition of high-end items, particularly those promoted or worn by celebrities, has become a means of establishing a sense of closeness or familiarity with these public figures. The evolution of luxury brand marketing strategies over time is also worth considering. While promotion used to be sophisticated and direct, the 1990s saw a shift towards celebrity endorsements. This shift, however, poses challenges to luxury brands that still try to maintain the exclusivity and prestige of their brands. Balancing the desire to increase sales with the risk of market saturation requires careful consideration.[11]

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10 Wang, Y. (2022). A conceptual framework of contemporary luxury consumption. *International Journal of Research in Marketing*, *39*(3), 788-803.

11 Apple, L., Southward, L., & Bickle, M. (2018). LUXURY THROUGHOUT HISTORY: AN EVALUATION OF THE INDUSTRY. *THE FUTURE OF LUXURY*, 8.

Thus, the dynamics of the industry are further complicated by global economic changes, changing demographics, and the pressing need for sustainability, all of which are pushing luxury brands to redefine their strategies and products on offer.

The fashion industry has demonstrated remarkable growth in terms of sales and revenues over recent decades. According to the statistics published by Statista Consumer Market Outlook, the luxury market has witnessed a consistent upward trend over the last twelve years. The industry was projected to grow by 4% in terms of economic profits in 2019[12]. However, the outbreak of the Covid-19 pandemic resulted in a drastic fall of around 90% in profits for the fashion sector[13]. Despite these challenges, fashion brands have displayed remarkable resilience, adapting to the new scenario and even innovating and expanding. In the following two years, 2021 and 2022, the revenues of the Luxury Fashion market resumed their stable trend and the estimates for the three-year period 2023-2025 are also positive (Figure 1).

The advent of new forms of communication enabled by modern technologies, including the Internet, mobile devices, e-commerce, and digital platforms, have played a pivotal role in keeping these companies afloat and operational during the pandemic, when physical stores were forced to close, and there was a contraction in demand for luxury goods.

In this regard, Gupta in 2014[14] indicated how e-commerce constitutes any form of transaction in which the parties interact electronically and not through physical contact; the same author also proposed another definition of e-commerce, indicating how it corresponds to the use of electronic communications and digital information processing technologies in business transactions in order to create, transform and redefine relationships between organisations and between organisations and individuals, in order to create value.

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12 Granskog, A., Lee, L., Magnus, K. H., & Sawers, C., *Survey: Consumer Sentiment on Sustainability in Fashion.* Mckinsey & Company, 2020. Reperibile in: http://dln.jaipuria.ac.in:8080/ jspui/bitstream/123456789/6817/1/Survey-Consumer-sentiment-on-sus tainability-in-fashion.pdf
13 McKinsey & Company, *The state of fashion 2023*. Reperibile in: https://www.mckinsey.com/~/media/mckinsey/industries/retail/our%20insights/state%20of%20fashion/2 023/the-state-of-fashion-2023-holding-onto-growth-as-global-clouds-gathers-vf.pdf
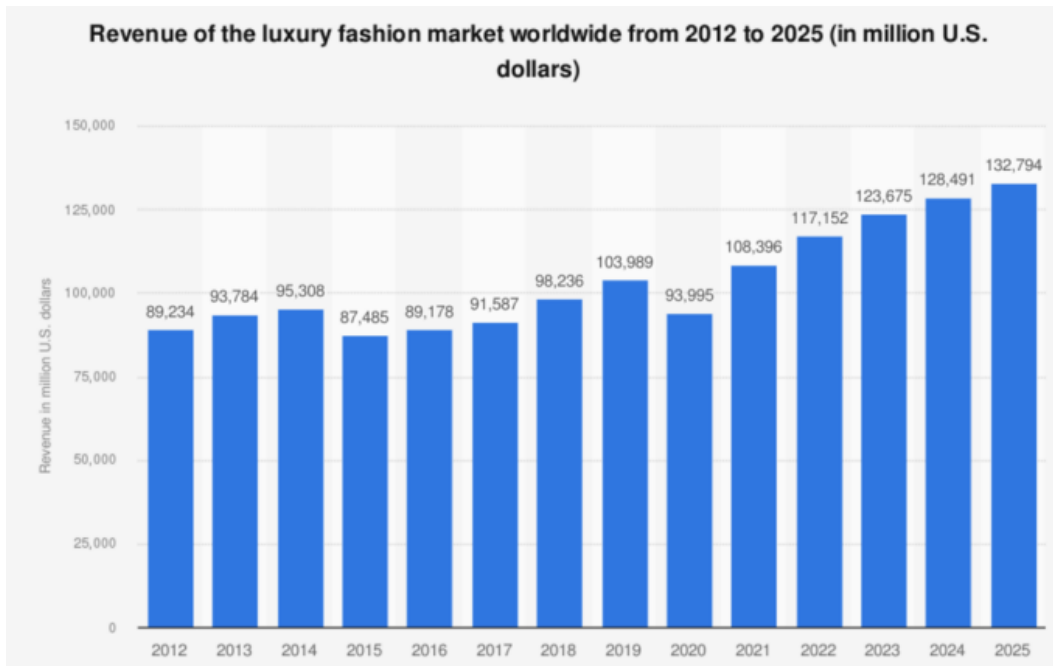14 *Ibidem*

Figure 1 - Luxury fashion market revenues between 2012 and 2022 and revenue estimates for the three-year period 2023-2025 - Source: Statista Consumer Market Outlook, 2022.

In particular, the luxury brand groups LVMH [15](Figure 2) and Kering[16] (Figure 3) led the sector's recovery although they too suffered significant losses during 2020. As can be seen from the graphs below, the two groups showed very similar growth profiles over time: the revenues of both grew until 2019 before abruptly slowing down in 2020 and picking up again from 2021.

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[15] LVMH is a French multinational corporation and conglomerate headquartered in Paris founded in 1987 and currently owning more than seventy brands divided into haute couture companies such as Christian Dior, DKNY, Fendi, Céline, Guerlain, Marc Jacobs, Givenchy, Kenzo, Loro Piana, Emilio Pucci, Louis Vuitton and many others.

[16] The Kering Group was established in 1963 with headquarters in Paris and encompasses high-end fashion, leather and jewellery brands, including Gucci, Yves Saint Laurent, Bottega Veneta, Balenciaga, Alexander McQueen, Brioni and many others.
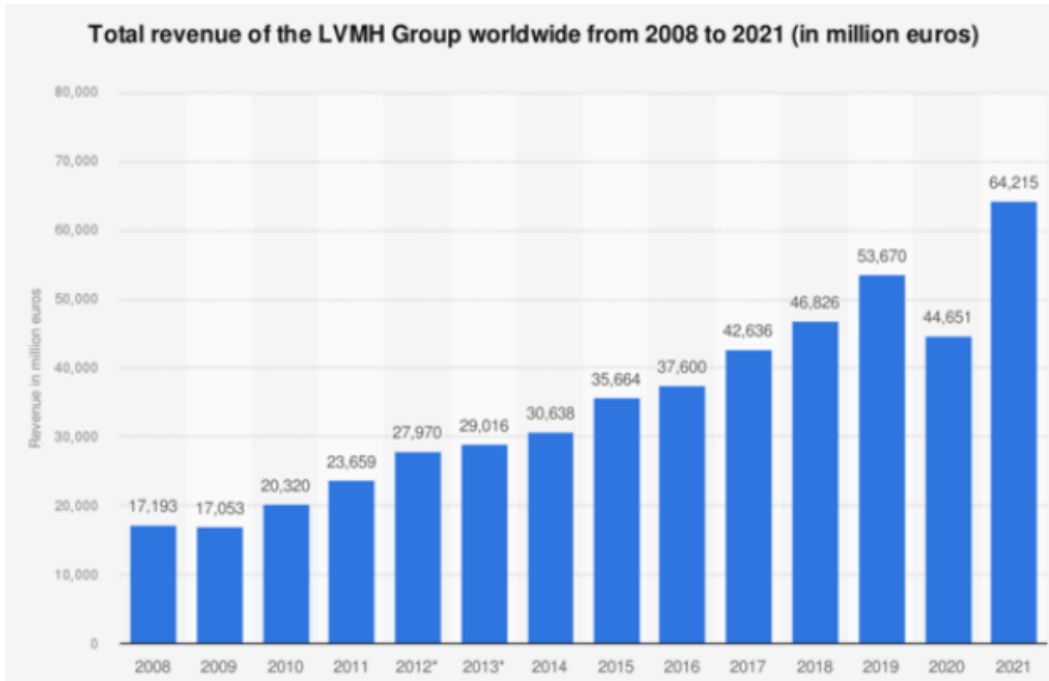
Figure 2 - LVMH Group revenue between 2008 and 2021 - Source: Statista, 2022 [17]
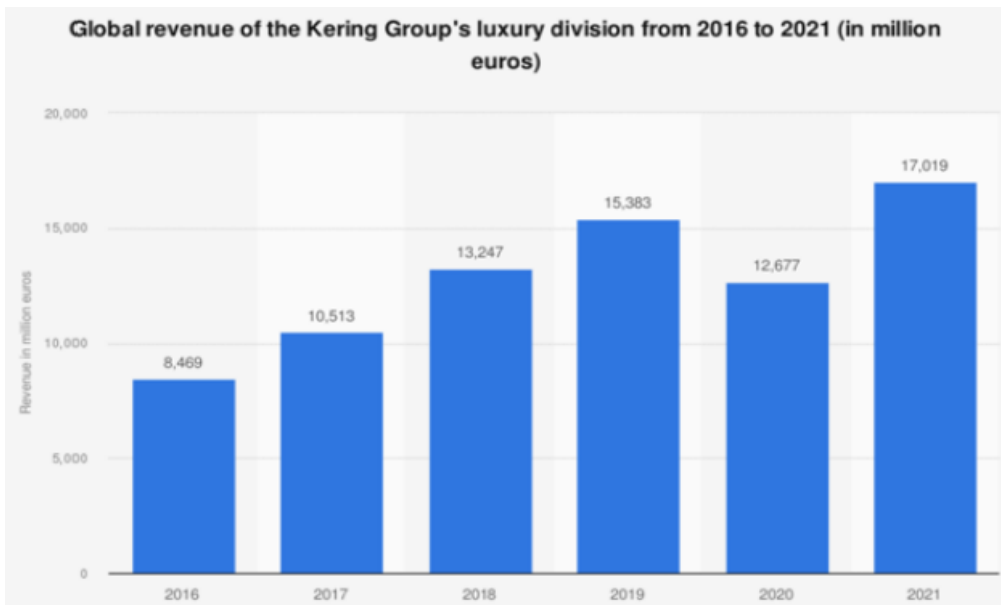
Figure 3 - Kering Group revenue between 2016 and 2021 - Source: Statista, 2022[18]

[17] Statista, *Total revenue of the LVMH Group worldwide from 2008 to 2023,* 2024. Reperibile in: https://www.statista.com/statistics/245852/total-revenue-of-the-lvmh-group-worldwide/

[18] Statista, *Global revenue of the Kering Group's luxury division from 2016 to 2021,* 2024. Reperibile in: https://www.statista.com/statistics/914951/global-revenue-of-kering-group-luxury-division-worldwide/

Generally speaking, all these data show that in the face of sometimes very negative forecasts regarding the consequences that Covid-19 would have produced in the fashion market and especially in the luxury sector, brands have instead been able to characterise themselves by high levels of resilience, which have allowed them to adapt to the new scenario, survive and in some cases even grow and innovate. In doing so, a highly significant contribution has been made by the use of new forms of communication enabled by the most modern technologies.

2. Key Drivers of the Fashion Luxury Industry

Fashion is an interesting mode of expression that embodies elements of both style and change, highlighting rearrangements in the economy, politics, culture, and society. It allows the public to express their personal preferences and ways of living, while trends represent a collective fashion sense within our society . Designers decipher said trends and convert them into tangible products, but the industry approaches a challenge when meeting the fast-changing demands of customers. The fashion industry works within the wider "fashion system," surrounding both art and business, as well as production and consumption. Its distinctive nature is characterized by its spirited, complex, and ever-changing attributes.

 At the moment, it stands as a dynamic and multifaceted sector, deeply influenced by the shifting landscapes of consumer behaviour, technological progress and global market forces. Its luxury segment, in particular, embodies the intricate balance between tradition and innovation, exclusivity and accessibility[19]. This detailed overview delves into the critical aspects of the industry, including competition, the imperative for innovation and differentiation, globalization, and the industry's inherently dynamic structure.

19 Ramunė Čiarnienė, Milita Vienažindienė,Management of Contemporary Fashion Industry: Characteristics and Challenges,Procedia - Social and Behavioral Sciences,Volume 156,2014

The luxury sector, traditionally characterized by craftsmanship and haute couture, has been greatly democratized by technological advances and societal shifts towards more inclusive and sustainable consumption, making luxury more accessible to a wider and more discerning audience through ready-to-wear collections.[20]

In a fiercely competitive landscape, where the pace of trend cycles accelerates and consumer preferences evolve rapidly, luxury brands must innovate relentlessly. This innovation ranges from integrating advanced technologies such as artificial intelligence, augmented reality and blockchain for authenticity verification, to investing in environmentally friendly materials and production methods in line with ethical consumer standards. With the rapid pace of technological advances, such as 3D printing and sustainable production processes, brands are developing new materials and production methods that meet the demands of sustainability and ethical fashion[21].

The effect of the web and digital technologies on the market and its various sectors has been noteworthy. While it has been commanding for some, the luxury sector has had problems in trying to adapt to these evolutions. The quick change in consumer habits and the favorable outcome of online channels have forced brands to rethink their marketing and communication campaigns and strategies.[22]

The integration of e-commerce and websites produced new ways for companies to be involved with customers and offer various services through different channels. This has led to the development of multi-channel strategies by retailers, giving them the opportunity to interact with consumers in more precise and targeted ways.

Technological innovations have also enabled deeper channel integration, cost reduction, wider access to information, and the ability to develop more effective promotions.

Fashion and luxury retailers need to strike a balance between innovation and tradition, especially as they seek to renew physical stores with innovative in-store technologies

20 Cabigiosu, A., & Cabigiosu, A. (2020). An overview of the luxury fashion industry. *Digitalization in the luxury fashion industry: Strategic branding for Millennial consumers*, 9-31.

21 Akhtar, W. (2023). Digital innovations in fashion: mapping the co-evolution of technological advancements and fashion industry. *JYU Dissertations*.

22 Rios, A. E. (2016). The impact of the digital revolution in the development of market and communication strategies for the luxury sector (fashion luxury). *Central European Business Review, 5*(2), 17-36.

that optimize the physical channel[23]. Ultimately, the goal for omni-channel retailers is to meet consumer demands and increase customer satisfaction by adopting a consumer-centric perspective.[24] The digital revolution has pushed the industry into a new era, with e-commerce and social media platforms enabling unprecedented direct consumer engagement. The rise of digital media has democratized fashion, giving rise to influencer culture and fast fashion trends that challenge established names with rapid trend adoption and lower prices. The growing importance of online shopping for mass market and luxury fashion items has forced fashion brands to collaborate with online platforms in order to survive in the market and increase their reach.[25]

Nonetheless, many 'old school' fashion companies are still hesitant about associating with e-commerce giants, as they are fearful of losing control over their company.

When brands agree to join forces with online platforms, they are forced to sign agreements that result in being beneficial for both parties. This means making sure that the brand's image and reputation are maintained, while also giving the platform the necessary information to successfully market the products. Fashion companies can no longer avoid e-commerce, and partnering with big online players is definitely an effective way to expand sales while also extending brand awareness around the world[26].

The need for differentiation in this industry is stronger than ever. Brands are in constant competition to dominate the market and they do so with various strategies such as: unique design aesthetics, heritage storytelling, better quality, bespoke services, combative marketing, celebrity endorsements and exploiting digital platforms to directly engage with consumers. This distinction is also marked by a commitment to social and environmental responsibility, which progressively resonates with consumers.[27]

23 Chevalier, M., & Gutsatz, M. (2020). *Luxury retail and digital management: Developing customer experience in a digital world*

24 Aiolfi, S., & Sabbadin, E. (2019). Fashion and new luxury digital disruption: The new challenges of fashion between omnichannel and traditional retailing. *International Journal of Business and Management*, *14*(8), 41-51.

25 Gazzola, P., Pavione, E., Pezzetti, R., & Grechi, D. (2020). Trends in the fashion industry. The perception of sustainability and circular economy: A gender/generation quantitative approach. *Sustainability*, *12*(7), 2809

26 Gazzola, Patrizia, Enrica Pavione, Roberta Pezzetti, and Daniele Grechi. 2020. "Trends in the Fashion Industry."

27 Karl, C. (2017). *The State of Fashion 2017*. McKinsey Global Institute.

Furthermore, influencer marketing and digital-first strategies are reshaping the way brands launch and promote their products, further challenging the traditional fashion world.

Globalization has stretched the reach of luxury fashion brands, allowing them to discover emerging markets and address a wider audience. This expansion, coupled with the democratization of fashion through digital media, requires a deep understanding of local cultures and different market dynamics. Successful global brands manage to balance global brand consistency with localized strategies, offering region-specific suggestions while still maintaining a global brand image [28].

On the other hand, it is crucial to also remain agile, adapting to rapid trend cycles and changes in consumer demand, which now bring brands to introduce new collections more frequently. Looking ahead, luxury brands always face more pressure to balance innovation with tradition, exclusivity with accessibility, and global reach with local relevance, amid global economic uncertainty, supply chain disruptions and fluctuating consumer confidence. They will need to employ sophisticated data analysis and trend forecasting systems to anticipate market changes and consumer preferences.

Hence the fashion and luxury sectors are complex ecosystems characterized by the need for continuous innovation, strategic differentiation, and agile adaptation to global influences[29]. Navigating this complex web of challenges and opportunities, where success depends on the ability to innovate, differentiate, globalize, and adapt, is critical for any brand wishing to carve out a significant presence in the competitive fashion industry. Success in the luxury fashion sector will depend on a brand's ability to navigate multifaceted challenges while staying true to its values and identity.[30]

28 Salehzadeh, R., & Pool, J. K. (2017). Brand attitude and perceived value and purchase intention toward global luxury brands. *Journal of international consumer marketing*, *29*(2), 74-82.

29 Gazzola, P., Pavione, E., Pezzetti, R., & Grechi, D. (2020). Trends in the fashion industry. The perception of sustainability and circular economy: A gender/generation quantitative approach. *Sustainability*, *12*(7), 2809

30 Karl, C. (2017). *The State of Fashion 2017*. McKinsey Global Institute.

In recent years, sustainability has become an increasingly important factor in consumers' purchasing decisions. This is due to factors such as population growth, climate change, and scarcity of land and water. These challenges have intensified the pressure on the fashion industry to take sustainability seriously, not just in terms of the products they produce, but also the production processes they use.

Fast fashion has emerged as a new phenomenon that amplifies these problems, leading to high water consumption, hazardous chemical discharge, increased waste, human rights violations, and increased greenhouse gas emissions. In a neuroscientific study to Explore Consumers' Intentions Towards Sustainability within the Luxury Fashion Industry the hypothesis highlighted is that consumers who prioritize sustainability may show greater cognitive and emotional responses when presented with stimuli focused on sustainability than those who do not[31].

Consumers are increasingly demanding transparency across the entire value chain and expect to have more information about the origin of goods and the quality of materials used. Brands are responding to these challenges by striving to be more transparent and specifying the costs of materials, labour, transport, and taxes[32]. Many initiatives across industries are helping companies to identify more sustainable work practices throughout the product life cycle. Several brands have publicly set sustainability goals and established standards for importing fabrics while promoting initiatives to improve innovation in the materials used for producing fashion items[33].

31 Balconi, M., Sebastiani, R., & Angioletti, L. (2019). A neuroscientific approach to explore consumers' intentions towards sustainability within the luxury fashion industry. *Sustainability*, *11*(18), 5105

32 Richards, H. (2021). Rethinking value:'Radical transparency' in fashion. *Continuum*, *35*(6), 914-929
33 Gazzola, P., Pavione, E., Pezzetti, R., & Grechi, D. (2020). Trends in the fashion industry. The perception of sustainability and circular economy: A gender/generation quantitative approach. *Sustainability*, *12*(7), 2809.

3. The evolution of marketing in the luxury fashion industry

The evolution of marketing in this sector has been a curious phenomenon. In earlier stages of traditional marketing (marketing 1.0), products were primarily advertised by printed media, radio, and television, with a focus on product features. However, with the growth of technology, marketing strategies have lately undergone significant changes(marketing 2.0), giving a chance to companies to arrive to a broader customer base The internet has played the most important role in this change, revolutionizing the working models of communication and advertising promotion [34]. The introduction of humanistic marketing in the third era (marketing 3.0) led to a change in focus towards building strong emotional ties with customers Companies started to collect as much information about their customers in order to better comprehend their purchasing patterns and decisions and what factors influenced them. With the fourth era (marketing 4.0), the amalgamation of offline and online marketing has allowed customers to enjoy the best of both worlds. Thus, they can easily consult websites and make purchases in physical stores without any problems[35].

The evolution of marketing has also demanded a more digital approach to communication, with a shift from unidirectional communication to two-way communication. The new generations represented by the millennials and Gen Z prefer to have direct contact with brands to enjoy a greater purchasing experience that goes beyond the moment of sale[36].

The future of marketing is exciting, and a new era has begun. Companies must continue to adapt their marketing strategies to meet the changing needs of their customers while leveraging technology to deliver personalized and engaging experiences[37].

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34 Zambrano, L. M. V., Quintero, F. Á. L., Calderón, M. G. M., Alcívar, K. G. Z., Cusme, Y. A. Z., & García, K. A. M. (2022). Evolution from traditional marketing to digital marketing as a formative process. *Journal of business and entrepreneurial studie*, *6*(3).

35 Kotler, P. et al., *Marketing 4.0: Dal tradizionale al digitale*, Italia: Hoepli, 2017, pp. 633.

36 Addis M., *Ad uso e consumo. Il marketing esperienziale per il manager*, Milano, Pearson Education, 2007

37 Kotler, P., *Marketing 5.0. Tecnologie per l'umanità*. Milano: Hoepli, 2021.

The construction of interactive digital environments and the numerous investments in technological innovation and e-commerce are currently a trend shared by an increasing number of fashion and luxury brands. In this respect, the McKinsey report 'The State of Fashion 2022' already predicted that by 2022 fashion brands would embrace new approaches to creativity and online commerce using tools such as the metaverse, virtual reality, NFT's (Non Fungible Tokens)[38].

As a result of the pandemic, a further change was seen within the no longer only physical but also digital fashion shows where luxury brands had to, thanks to the use of digital, experiment and rethink their way of communicating and exhibiting their collections.

After 2020 several fashion brands opened their own virtual stores in the "metaverse", launching virtual shops, games and promoting digital events [39]without, however, neglecting the needs and requirements of the customers that still prefer a physical shop and the possibility to buy from a real store. In particular, in order to satisfy the needs of this segment of customers, companies have adopted technological solutions that allow for the integration of online services with real services such as "live streaming shopping", "customer service in live chatting" and "augmented reality"[40].

The fashion and luxury sectors are marked by intense competition, fuelled by the rapid pace of trend cycles and the consumers' ever-evolving preferences. Brands vie for market dominance through various strategies, including aggressive marketing, celebrity endorsements, and leveraging digital platforms to engage directly with consumers. The competition extends beyond traditional luxury brands to include new entrants and fast-fashion retailers, who challenge established names with quick trend adoption and lower price points, making the market landscape even more complex.

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38 McKinsey & Company, Business of Fashion, 2022. Reperibile in:
https://www.mckinsey.com/~/media/mckinsey/industries/retail/our%20insights/state%20of%20fashion/2022/the-state-of-fashion-2022.pdf
39 *Ibidem.*
40 Calamitosi, S., *Il digitale spinge il settore del lusso verso l'omnicanalità. Ecco come sarà il retail del futuro tra store management innovativo e marketing sensoriale.*, 2018.

Innovation within the fashion industry is of greatest importance, encompassing product design, materials and digital technologies. For luxury brands, innovation is often linked to integrating technology with traditional craftsmanship to create unique and desirable products. Technological progress, such as 3D printing and sustainable manufacturing processes, are more and more important in the development of new materials and production methods that meet the growing consumer demand for sustainability and ethical fashion. Furthermore, digital innovation in e-commerce, customer engagement through augmented reality, and AI-driven personalization are reshaping the retail experience.

Differentiation is a critical strategy for brands within this packed market, especially for luxury labels that aim to maintain their exclusivity and appeal. This differentiation can be realised by unique design aesthetics, heritage storytelling, superior quality, and bespoke services. Luxury brands also differentiate themselves through sustainability initiatives, demonstrating a commitment to social and environmental responsibilities, which increasingly resonates with consumers seeking to make more ethical purchases[41].

The globalisation of the fashion industry has expanded the reach of brands, allowing them to gain access to new markets and attract a global customer base. However, it also needs an understanding of diverse cultural tastes, consumer behaviours, and regulatory environments. Successful global brands skilfully balance global brand consistency with localized strategies to cater for specific needs within different territories. The digital age has accelerated globalization, enabling brands to connect with consumers worldwide through e-commerce platforms and social media.

The structure of the fashion industry is inherently active, driven by the fast-paced nature of fashion cycles, technological progress and shifting consumer expectations. The growth of digital media has democratized fashion, giving power to influencer culture and fast-fashion trends that challenge the traditional fashion calendar. Luxury brands must navigate this dynamism by continually evolving their strategies, from product

41 Sperber, S. C. (2016). The luxury market in the fashion industry: A conceptual segmentation.
In *Handbook of research on global fashion management and merchandising* (pp. 156-185). IGI Global.

development to marketing and distribution, in order to stay relevant in an ever-changing landscape.

In conclusion, the fashion and luxury sectors are navigating a complex web of challenges and opportunities, where success hinges on the ability to innovate, differentiate, globalize, and adapt to a rapidly changing environment. Understanding these dynamics is crucial for any brand looking to carve out a significant presence in the competitive fashion industry.

4. The Transformation of Luxury Fashion Through Technological Advancement: the future challenges and opportunities

In today's rapidly evolving technological landscape, luxury and fashion brands can leverage the latest progress to create more appealing and unforgettable experiences for their customers across multiple channels. This means creating virtual environments that offer a seamless and ideal user experience, accurately forecasting trends and events, and identifying the finest technological solutions. The fashion luxury sector is no exception when it comes to using said trends.[42]

Through a thorough analysis of all the variables at play, companies can grow communication, improve customer relations, and gain a competitive advantage over rivals. Currently, the ability to make accurate predictions appears highly likely due to the use of artificial intelligence (AI), which has been defined as a system capable of correctly interpreting external data, learning from that data, and using that knowledge to achieve goals or perform tasks [43].

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42 Grewal, D., Roggeveen, A. L., Sisodia, R., & Nordfält, J., Enhancing customer engagement through consciousness. *Journal of Retailing*, *93*(1), 2017, pp. 55-64; sullo stesso tema si veda anche Harba, J. N., *New approaches to customer experience: where disruptive technological innovation meets luxury fashion*. In *Proceedings of the International Conference on Business Excellence*, Vol. 13, No. 1, 2019, pp. 740-758.

43 Loureiro, S. M. C., *Artificial Intelligence and Extended Reality in Luxury Fashion Retail: Analysis and Reflection*. In *Augmented Reality and Artificial Intelligence: The Fusion of Advanced Technologies*, Cham: Springer Nature Switzerland, 2023, pp. 323-348; si veda anche Chung, M., Ko, E., Joung, H.,

In the luxury fashion retail sector, an increasing number of managers are recognizing the benefits of adopting artificial intelligence. Although there is currently limited literature available on the use of AI in this sector, a few publications have explored the potential of this tool to create functional virtual environments that can enhance the consumer shopping experience by offering personalized online services. Specifically, these studies have conducted simulations of interactions between potential customers and virtual stores through PC or mobile phone apps, in order to identify factors that can influence purchasing decisions and evoke positive emotions in customers, either affectively or cognitively; in other cases, an attempt was made to identify any criticalities that were lowering the level of satisfaction of the potential buyer[44].

Also thanks to artificial intelligence, an attempt was made to understand whether certain elements in the virtual store could facilitate or hinder the purchase, such as the presence of music or a particular configuration of the graphic interface[45].

A successful experience in this sense is represented, with specific reference to the luxury fashion sector, by the recent spring-summer 2024 campaign of ETRO, a Milanese brand of international fame, which was created entirely by artificial intelligence[46]: the campaign involved the alternation of scenes and pictures in which starry skies and astral maps were represented, which slowly transformed into closed and accessible environments in which unusual vegetation and humanoids were present, some with familiar shapes and others with alien shapes.

According to ETRO's Creative Director Marco De Vincenzo, the use of artificial intelligence allowed the brand to shape a vision of the world and represent a non-place,

Kim, S.J., *Chatbot e-service and customer satisfaction regarding luxury brands*, Journal of Business Research, 117(C):587–595, 2020.

44 Measures of the degree of satisfaction of the user experience, the ability to use virtual tools accurately and the allocation of consumer attention were investigated with self-report questionnaires, direct observation of real conduct or the use of state-of-the-art tools such as eye-tracking (Louriero, 2023), respectively.

45 Loureiro, S. M. C., *Artificial Intelligence and Extended Reality in Luxury Fashion Retail: Analysis and Reflection*. In *Augmented Reality and Artificial Intelligence: The Fusion of Advanced Technologies*, 2023, pp. 323-348.

46 The campaign was carried out by Creative Director Marco De Vincenzo and Digital Artist and Prompt Designer Silvia Badalotti..

the nowhere concept. Moreover, the use of this new technology has allowed the Milanese brand to test the potential of artificial intelligence and, in this way, differentiate itself from its competitors by conveying to consumers the idea that the brand is in step with the times (Figure 4).

Figure 4 -Picture from the ETRO spring-summer campaign -Source: Vogue Italia [47]

In 2023, a similar experience was conducted by Balenciaga, which had reproduced, thanks to artificial intelligence, a fashion show in which its clothes were worn by Harry Potter. The video immediately went viral, proving very popular with consumers who shared it with their contacts, thus guaranteeing the brand high visibility. The product created was in itself amusing but also surreal, a result that was expected by the creators of the video, who intended to link the Balenciaga brand to the concept of unusualness and absolute non-conformity to traditional schemes (figure 2).

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[47]Available online at : https://www.vogue.it/article/intelligenza-artificiale-campagna-etro-marco-de-vincenzo

Figure 5 - Image of the Balenciaga fashion show - Source: Youtube [48]

Moreover, the integration of chat-bots into the luxury fashion retail sector represents significant technological progress that poses both challenges and opportunities. Chat-bots, which leverage AI and NLP to comprehend customer questions and create automated responses, imitate human conversation [49]. Given the amount of time modern luxury consumers spend in virtual shopping environments, luxury brands have increasingly adopted chat-bots, whose function is to act as e-service agents, to provide real-time interaction with customers and offer support throughout the purchase process.

At the beginning, the use of chat-bots in the fashion market and by luxury fashion brands was seen as dangerous, as these tools were not able to efficiently replicate communication similar to human interactions [50]. However, more recent studies have demonstrated that chat-bots have become an instrumental resource for companies, as they can emulate the role of salespeople in real stores, elegantly represent the brand, establish stronger bonds between buyers and the brand, provide useful information,

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[48] The video is available online at :https://www.youtube.com/watch?v=iE39q-IKOzA

49 Chung, M., Ko, E., Joung, H., & Kim, S. J., *Chatbot e-service and customer satisfaction regarding luxury brands. Journal of Business Research*, *117*, 2020, pp. 587-595.

50 Batat, W., *Digital luxury. Transforming Brands & Consumer Experiences.* New York: Sage Publications, 2019, p. 164.

expedite the purchase process, and create a pleasant shopping experience for consumers, which ultimately increases the degree of customer engagement[51].

In a recent study conducted by Chung and his research team in 2020, the effect of chat-bots on consumer satisfaction in the luxury fashion industry was studied and explored. The study examined virtual services provided by different luxury brands, such as Salvatore Ferragamo, Burberry, Louis Vuitton, Prada, Gucci, and Tommy Hilfiger. The study results demonstrate that chat-bots can significantly enhance consumer satisfaction if they are able to demonstrate certain characteristics such as accuracy, credibility, and competence in communication. Although there are limited studies that have attempted to verify the degree of influence of chat-bots on consumers' purchasing decisions or satisfaction, the initial data can suggest that the success of this tool will be conditional on the management's ability to supply a real service that is perceived as functional in providing information and entertainment to the customer [52].

Also immersive technologies are playing a significant role in the transformation of the luxury fashion industry[53]. These technologies encompass a broad range of tools and devices that enable individuals to experience highly realistic, real-world-like experiences in the virtual world. Virtual reality, augmented reality, and the metaverse are some examples of these technologies that are progressively being accepted and used by luxury fashion brands and other sectors of the economy. The integration of these new technologies has allowed luxury fashion houses to strengthen their relationship with customers and introduce innovative business models that were previously unfeasible. Innovation has emerged as a critical factor in maintaining a competitive market position and keeping up with rivals who are increasingly responsive to new social trends.[54]

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51 Lowry, P. B., Romano, N. C., Jenkins, J. L., & Guthrie, R. W., *The CMC interactivity model: How interactivity enhances communication quality and process satisfaction in lean-media groups.* Journal of Management Information Systems, *26*(1), 2009, 155-196.

52Fionda, A. M., & Moore, C. M., T*he anatomy of the luxury fashion brand. Journal of brand Management*, *16*, 2009, pp. 347-363.

53 Altarteer, S., & Charissis, V., *Technology acceptance model for 3D virtual reality system in luxury brands online stores*. Ieee Access, 2019, p. *7.*

54 Harba, J. N., *New approaches to customer experience: where disruptive technological innovation meets luxury fashion*. In *Proceedings of the International Conference on Business Excellence*, 13, 1, 2019, pp. 740-758.

Virtual reality (VR) is an interactive three-dimensional environment that simulates reality, allowing people to move, communicate and interact virtually through the use of technological devices. Users, through avatars, can roam free in virtual spaces and manipulate objects, replicating real-life action[55]. Virtual reality experiences can be immersive or non-immersive. In the former experiences, devices such as visual helmets, motion detectors and wired gloves isolate the user sensorially, immersing them fully in the virtual world. In the latter, it happens through a monitor, maintaining active contact with the real-life environment and surroundings.

Recently, virtual reality has also started to find application in the luxury fashion industry, offering consumers unique immersive experiences, such as the ability to virtually attend fashion events or explore virtual shops. Moreover, through 3D technologies, people are able to see products from all possible angles and, guided by specific systems, can be informed about the aesthetic and functional strengths of the product they are interested in[56]. Luxury brands such as Gucci, Dolce & Gabbana, Balenciaga, Hugo Boss, and Max Mara have recently made significant investments in new technology.

For example, Dolce & Gabbana has invested in the virtual boutique experience project offering its customers new shopping solutions without physical or temporal boundaries, as they can visit virtual stores and immerse themselves in the Dolce & Gabbana world whenever and from wherever they want. Another virtuous example in this sense is the experience of Ralph Lauren, which created a virtual shop in which customers could take a sort of digital journey into the world of the brand and carry out, with just a few clicks, transactions typically carried out in physical shops (Figure6). Moreover, the virtual store was able to faithfully reproduce the atmosphere of the physical store thanks to the care taken in the layout and aesthetics: this allowed people to have a highly meaningful experience.

55 Wohlgenannt, I., Simons, A., & Stieglitz, S., *Virtual reality. Business & Information Systems Engineering*, *62*, 2020, pp. 455-461.

56 Harba, J. N., *New approaches to customer experience: where disruptive technological innovation meets luxury fashion*. In *Proceedings of the International Conference on Business Excellence* (Vol. 13, No. 1, 2019, pp. 740-758

Figure 6 - Ralph Laurent virtual experience store - Source: Forbes

All these operations must be carried out in a highly immersive manner reminiscent of real life experiences experienced during offline shopping as the very concept of luxury is strongly associated with that of 'experience' or 'perception of the value of the experience' which must be fulfilling and memorable. Indeed, the user experience of luxury fashion consumers is strongly associated with the attitude they show towards the product and brand, as well as with their intention to shop online.

This trend is driven by the observation that younger generations have a strong inclination to make purchases in the metaverse. For instance, the Roblox platform alone recorded the sale of over a billion digital fashion items in 2022. The potential implications of the metaverse are enormous, with the Goldman Sachs agency estimating figures close to 8 trillion dollars in the coming years. Moreover, a report compiled by the Roblox platform states that about 70% of its users, mainly young people under the age of 25, buy fashion items for their avatars, emulating their real-world fashion choices[57].

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57 Joy, A., Zhu, Y., Peña, C., & Brouard, M., *Digital future of luxury brands: Metaverse, digital fashion, and non-fungible tokens*. *Strategic change*, *31*(3), 2022, pp. 337-343.

As a result, people who are accustomed to purchasing luxury clothing or accessories are also expected to repeat this behaviour in the metaverse for their avatars. It's worth noting that the Metaverse Fashion Week, which includes digital fashion shows and the purchase of real or virtual objects, was held in March 2023. It is now an annual event that showcases the potential of the metaverse[58].

Studies have also confirmed that virtual shops compared to physical stores are equally able to provide emotional involvement during the shopping experience and allow people to be an active part of this experience. Quality design, the possibility to obtain all the desired information, the possibility to save time and the perception of having an aesthetic experience are the most important factors to increase the positive evaluation held towards the brand and the products themselves. Levels of interactivity and immersiveness in turn lead to an increase in positive attitudes towards the brand as they compensate for the absence of physical interaction with salespeople[59].

These technological innovations, including an increasing use of the metaverse, are transforming the way luxury brands interact with consumers, enhancing the customer experience and increasing the personalization of services.

In addition, the metaverse offers a new scenario for fashion companies to create and experiment with new business models, enriching the consumer experience and fostering brand loyalty. Projections indicate that the virtual and augmented reality market could reach significant values in the coming years, with an increasing impact on digital commerce in the luxury sector.

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58 Joy, A., Zhu, Y., Peña, C., & Brouard, M., *Digital future of luxury brands: Metaverse, digital fashion, and non-fungible tokens. Strategic change, 31*(3), 2022, pp. 337-343.
59 Toma, C. H., *The Shop of the Future: Bridging the Online/Offline Experience Gap in Fashion Retail Through Virtual Reality*. In I. R. USA, Fashion and Textiles: Breakthroughs in Research and Practice, Hershey: IGI Global., 2018, pp. 42-69.

CHAPTER 2
LITERATURE REVIEW

2.1 The apparent tension between luxury and sustainability

Traditionally associated with excess, luxury is evolving to include sustainability as a requisite. Luxury brands view sustainability not as an option but as a necessity for long-term success, recognizing the sector's impact on natural resources and the environment. Despite the widely held belief that luxury and sustainability are contradictory, research can show us their intricate connection. According to a further investigation by Kapferer and Jean-Noël (2010), luxury and sustainable development share a common base: prioritizing permanence and uniqueness. High-end companies have cleverly addressed the problem of balancing luxury and sustainability by implementing creative strategies to demonstrate their commitment to environmentally conscious operations. As demonstrated by Kapferer Jean-Noël and Anne Michau (2015), the clear tension between sustainability and luxury is mainly determined by how the consumer can define luxury, resulting in customers placing a lower value on it when it is linked to excellent quality.

Experiments conducted by Matteo De Angelis Feray Adıgüzel and Cesare Amatulli (2017), suggest that in order to attract the interest of consumers in environmentally sustainable products, it can be more productive to align the new green luxury products on offer with the brand's existing models rather than those from green companies. This can be accurate for consumers that are aware of the brand and for products with a long-lasting appeal. Research specifies how consumers react to luxury brands emphasizing one of the two: sustainability and product excellence in their communication. The perception of atypicality emerges as pivotal: when consumers perceive the brand's communication as different and individual, they can be more disposed to making a purchase (Cesare Amatulli, Matteo De Angelis & Carmela Donato, 2021). This effect is noticed especially among consumers who seek to demonstrate their individuality through apparel. In particular, the success of a sustainability-focused communication

strategy in enhancing atypicality and purchase intent is linked to the domain of luxury products.

The uncertainties inherent in this transition are exacerbated by the shaded reactions of consumers, segmented into different age groups, each of which provides unique perspectives and expectations to the luxury consumer landscape. A cross-generational international comparison, carried out by Kapferer Jean-Noël and Anne Michau (2020), reveals that millennials' sensitivity to the sustainability of luxury brands when making luxury purchases is not so different from older generations. Interestingly, millennials are the demographic group most likely to perceive luxury and sustainability as contradictory. Another publication (2013) by the same author mentioned above finds that luxury consumers with lower incomes tend to see a greater discrepancy between luxury and sustainability. Their perception of this contrast is influenced by various factors. Specifically, their awareness of sustainable development issues and their engagement in sustainable behaviours tend to heighten their perception of contradiction.

Conversely, their affinity for luxury tends to diminish the perceived contradiction. Furthermore, their perception of luxury as promoting genuine values tends to lessen the contradiction, whereas viewing luxury as promoting superficial values tends to intensify it. Furthermore, according to Sun,J. J.,Bellezza, S.,&Paharia, N. (2021)' research , high-end products can be more sustainable than mass-market products because they have a longer life-cycle. Therefore, through effective marketing strategies that emphasise product durability one could better target and facilitate consumer decision-making between high-end and ordinary product.

Despite the common belief that high-end products last longer, consumers often overlook this when making a purchase. The research provides actionable strategies for marketers to encourage consumers to prioritize fewer, durable high-end products.

In this context, the noteworthiness of operational flexibility becomes predominant, as outlined in "Operations Rules" by David Simchi-Levi (2010). Simchi-Levi talks about the critical role of system flexibility in allowing luxury companies to navigate a market characterized by volatile, highly variable, and preference and trends that can be hard to predict. The shaded reactions of consumers demand a strategic approach where

operational practices and infrastructures are designed to be adaptable and responsive. This involves implementing flexible manufacturing systems, agile supply chain models, dynamic pricing strategies, and leveraging technology to enhance visibility and coordination across the supply chain. Operational flexibility enables luxury brands to swiftly adjust to market changes, demand fluctuations, and supply chain disruptions, thereby maintaining a competitive advantage and delivering customer value within a complex and globalized market.

It becomes clear that for luxury brands striving to harmonize sustainability objectives with the dynamic preferences and trends of a vast customer demographic, operational flexibility goes beyond being merely advantageous to clearly being essential. By adopting system flexibility, luxury enterprises can guarantee adaptability and agility amidst consumer uncertainties, thus keeping their position in the market and consistently providing unparalleled value to their clientele.

As sustainability becomes more and more essential in our society, adopting sustainable manufacturing techniques is a must for the long-term competitiveness of luxury brands. Overcoming challenges requires a holistic sustainability approach at every stage of the supply chain. While this means that initial expenses may be higher, it also means that sustainable practices offer long-term advantages, including lower operational costs through waste reduction and increased energy efficiency. In addition, thanks to the transformative role of artificial intelligence (AI), the fashion industry, often an accelerator of waste, is poised for significant change.

2.2 Advantages of adopting artificial intelligence in the luxury fashion industry

Dimiter Dobrev offers a formal definition of artificial intelligence (AI) in a comparison with the intelligence of a human being : AI will be such a programme which in an arbitrary world will cope no worse than a human. According to this definition, AI will be more intelligent than a human being at a certain level of intelligence. However, since we are unable to determine its precise value, we are unable to identify on which level it

is placed. Regarding the focus of this study, AI will lead to waste reduction through sales prediction and clothing trends, enhance customer experience, and decrease the number of unsold garments each season (Aditi Dhama Avneet Kaur, Esra S. Döngül & Neha Singh, 2024). Additionally, it reduces errors and speeds up the product delivery process through automated warehouse management. With AI, decisions in the fashion industry can be implemented quickly and efficiently, leading to fully planned processes without significant costs and pollution. This integration of AI fosters a more sustainable and customer-centric approach by aligning operations closely with consumers' preferences and environmental considerations.

As Muhammad Usman Tariq et al. (2021) shows in his research, the key drivers for exploiting AI include progress in IT power, data analytics, deep learning, and cloud computing. This technological progress enhances the agility and succesfulness of decision-making processes. However, the journey towards integrating AI is not an easy one and can be challenging. Cultural resistance, skill gaps, and the necessity for strategic planning shows significant barriers in adopting AI within luxury brands. These challenges show us the need for a strategy that not only embraces AI but also operational flexibility, thus enabling luxury brands to navigate the intricacies of combining luxury and sustainability, satisfying consumer demands for personalized and high-quality products, and managing the intricacies of a global supply chain. Integrating AI and operational flexibility can address the challenges faced by luxury brands, such as mixing luxury with sustainability, meeting consumer expectations for personalized and high-quality products, and navigating the complexities of the global supply chain.

Thus, in the field, understanding consumer behaviour is a must if the business wants to thrive. A recent study by Kumar et al. (2024), proposes an innovative approach that integrates machine learning algorithms to predict the consumer buying patterns in luxury fashion. By taking advantage by diverse models such as decision trees, ensemble methods, and neural networks, this methodology analyses various datasets including demographic information, online interactions, and historical purchase patterns. The main focus is on predictive analytics, aiming to improve the accuracy of forecasting models. By anticipating shifts in consumer preferences more accurately, businesses can

adapt and respond to market dynamics, thus boosting their competitiveness in the luxury fashion industry.

The capacity to specifically predict product demand in a business environment that is constantly changing is truly an important challenge. Many companies are using artificial intelligence (AI) technologies to help them deal with this complexity. A defined method regarding the combination of human expertise and AI in the prediction of operations does not actually exist. In response, Devadrita Nair and Maria Jesus Saenz created an original framework designed to maximize demand forecasting through the integration of AI capabilities with human analytical skills. Based on a product's lifespan and demand volatility, this paradigm divides forecasting techniques into four separate quadrants: AI Demand Sense, Expert Edge, Traditional Extrapolation, and Cluster and Predict. With its creative matrix, demand forecasting can be done in a customized manner that takes into account the particular characteristics of every product and market situation.

2.3 AI and Decision-Making: Reasoning, Prediction, and Processes

Understanding the link between decision-making and reasoning, is crucial, explains Jean-Charles Pomerol (1995), as both human cognition and artificial intelligence (AI) involve a process of reasoning. While people normally reason before taking decisions, exploring the connections between AI and decision-making is essential. One aspect of decision-making involves making a distinction between diagnosis and look-ahead processes. AI has been considerately applied to diagnosis, using expert systems, case-based reasoning, and theories such as fuzzy set and rough set. However, there has been a smaller focus on look-ahead reasoning in AI, which involves dealing with uncertainty and preferences.

In Prediction Machines, Agrawal, Gans, and Goldfarb describe prediction as the heart of decision-making in situations of uncertainty and recast the rise of AI as a drop in prediction costs. The authors propose that, by viewing AI through the lens of economics rather than mystique or fear, businesses can better navigate the impending transformations. They also highlight AI's role in enhancing prediction accuracy, which

in turn can drive innovation, efficiency, and new strategic opportunities across various sectors.

In parallel, Artificial intelligence (AI) has become increasingly integrated into organizational processes, sparking concerns about its potential to supplant human decision-makers. However, an article written by Mohammad Hossein Jarrahi (2018) offers a proactive perspective, emphasizing the symbiotic relationship between humans and AI in decision-making procedures. While AI excels in processing vast amounts of information and analysing complexity, humans bring intuitive reasoning to navigate uncertainty and equivocality. This concept aligns with the notion of intelligence augmentation, advocating for AI to enhance rather than replace human capabilities.

Considering the changes in organizational decision-making prompted by AI-based algorithms, Yash Raj Shrestha et al (2019) shows key contingency factors that influence both human and AI-based decisions. These factors include the accuracy of the decision search space, intelligibility of the decision-making processes and outcomes, size of the alternative set, speed of the decision-making process, and replication. By comparing human and AI-based decision-making processes along these dimensions, the article proposes a framework for optimizing organizational decision-making quality. The framework outlines three structural categorie: full human to AI delegation, hybrid sequential decision-making involving both human-to-AI and AI-to-human interactions, and aggregated human-AI decision-making. Through this comprehensive approach, organizations can leverage the strengths of both human intuition and AI's analytical capabilities to enhance decision-making processes effectively.

The review highlights the complicated relationship between luxury and sustainability, drawing attention to the potential of AI to address these challenges through improved efficiency, decision-making, and customer engagement.

2.4 AI for Sustainable Luxury: Bridging the Gap in Implementation and Impact

A noteworthy gap emerges in the detailed exploration of how AI technologies specifically address the challenges of integrating sustainable practices within luxury brands' operational activities. While the literature highlights what the potential benefits of AI in enhancing operational efficiency and sustainability could be, there is limited empirical evidence or case studies detailing the implementation strategies, outcomes, and consumer response to such initiatives within the sector. This gap highlights a need for in-depth analysis on the practical application of AI in aligning luxury brands' operations with sustainability goals, considering the unique market dynamics, consumer expectations, and the luxury value proposition.

Collaborative research between academic institutions and luxury brands could encourage innovation and provide practical insights into the scalability of AI solutions across different segments within the luxury industry. This approach would not only fill the identified literature gap but also contribute to the broader topic of sustainable luxury, offering a map for other luxury brands that might want to integrate AI into their operational and sustainability strategies effectively.

Addressing this problem requires a multidisciplinary approach that combines technological, managerial, and consumer behaviour perspectives to fully understand and take advantage of the AI's potential in crafting sustainable luxury experiences that resonate with what today would be an ethically conscious consumer.

CHAPTER 3
FINDINGS OF THE SURVEY

The survey

This constitutes the core of the entire paper. It is a qualitative investigation aimed at investigating how artificial intelligence is able to optimise production processes in the luxury sector and provide information regarding the identification of quantities of new products to be launched on the market. The research was carried out by means of interviews and starred IT & Planning Manager Daniel Bellini and Global Head of Supply Chain, Manufacturing, Innovation and & Sustainability Barbara Lissi, i.e. two people occupying top positions within the Fashion Luxury company Kering Eyewear Spa.

3.1. Research question and objectives

This study aims to answer the following research question: "how can artificial intelligence support decision-making processes to optimise and coordinate operational activities in companies producing luxury goods?". As reported in previous chapters, artificial intelligence is now used by most companies operating in the luxury fashion industry (Joy et al., 2022[60];). In particular, by providing more accurate estimates than those that can be provided by humans, AI is able to provide information on the sizing of the quantities to be launched and introduced on the market of new products, averting the risk of increasing, on an economic level, the costs of producing garments that will remain unsold and, on a sustainability level, of unnecessarily increasing the number of emissions that are necessarily produced in the production chain (Dhama et al., 2024[61]).

In other words, AI should ensure that companies can better manage their

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[60] Joy, A., Zhu, Y., Peña, C., & Brouard, M. (2022). Digital future of luxury brands: Metaverse, digital fashion, and non-fungible tokens. *Strategic change*, *31*(3), 337-343.

[61] Dhama, A., Kaur, A., Döngül, E. S., & Singh, N. Artificial Intelligence and Sustainable Green Fashion Industry. In *Handbook of Artificial Intelligence Applications for Industrial Sustainability* (pp. 74-91). CRC Press.

resources and make quick effective decisions by simultaneously considering the influences of multiple variables that can make it difficult to predict the correct quantities to produce (Bonato, 2021[62]).

The goal that companies typically try to achieve is to optimise production processes by minimising, within time series, errors in the estimates made (Mean Absolute Percentage Error; MAPE).

For a long time at Kering Eyewear, those working within the sales team, the supply chain team and the marketing team carried out in-depth comparisons prior to products launches to determine, together, the exact number of packages to be produced and launched on the market. However, the market responses systematically deviated from the estimates provided by the joint work of the three teams. It was therefore thought that AI, using machine learning techniques or other regression methods, could minimise the margin of error within a time series.

Five years after the introduction of AI in Kering Eyewear, it can be said that even the estimates provided by this new technology are often characterised by a margin of error. Although this technology is very precise and able to learn very quickly, it needs a lot of data in order to be able to process the information in the best possible way.

Therefore, there should be a team working in parallel with the machine to input data and consider new variables that could influence the final result.

Taking this into account, the management of Kering Eyewear chose to find another application for AI: this form of intelligence was in fact able to quite reliably find glasses and shapes that were similar to the product planned for the new launch in the past for that respective segment.

It was therefore decided to include this engine within the applications of the sales teams in order to make reliable forecasts.

[62] Bonato, G. (2021). The evolution of luxury brands presence in Chinese e-commerce market-Kering case. Venezia: Università di Venezia.

In this way, when those in the sales teams have to make decisions on the quantity of spectacles to be purchased, they can easily obtain information on how similar spectacles to those they are purchasing have performed in the past both globally and in the target market. In this way, it is possible to obtain an idea of the magnitude of performance of the object in question and reduce the risk of cannibalization.

With these interviews, an attempt was therefore made to understand the extent to which the Company oriented toward the use of new technologies was able to introduce and effectively use these technologies to gain a competitive advantage.

3.2. Methodology

This part of the work will describe the method used to conduct the study. On the following pages, the characteristics of the instrument used to collect the data (an exploratory interview) will be illustrated, as well as the characteristics of the study participants. Finally, this section will also describe the company in which the study was conducted.

3.2.1. Participants

Daniel Bellini, Global Head of IT and Planning at Kering Eyewear and Barbara Lissi, Global Head of Supply Chain, Manufacturing, and Sustainability took part in the study. Specifically, the position of Global Head of IT and Planning at Kering Eyewear, which encompasses IT and Demand Planning, is a multi-faceted and strategic role within the organisation. This position is responsible for leading the company's efforts in several critical areas to drive operational excellence, strategic growth and technological innovation.

The position of Global Head of Supply Chain, Manufacturing, and Innovation & Sustainability at Kering Eyewear involves overseeing all aspects of the supply chain including from vendor scouting, prototyping, procurement, purchasing, sourcing, to manufacturing up to the product delivery. This role requires a strategic approach to

effectively manage end-to-end supply chain operations, ensuring efficiency, cost-effectiveness and alignment with the company's products quality requirements and sustainability goals.

3.2.2. The interview

Each participant took part in a specially constructed interview for the purposes of the survey. In this interview the participants were simply asked to express their opinion and tell the story of their experience with the use of artificial intelligence in business processes.

Participants were free to speak and provide information with no time limit and no argumentative constraints. All interviews were conducted online and recorded (after obtaining consent from the interviewees) in order to be transcribed. The average duration of the interviews was 60 minutes.

3.2.3 Procedure

To initiate the interviews, the first step was to establish contact with the Chief Operating Officer of Kering Eyewear. The purpose was to present the objectives of the study, the methodology adopted, and the potential practical applications of the knowledge that would be obtained. The COO expressed an immediate interest in the research and agreed to facilitate our contact with two members of the company team who are directly involved in the development of projects related to artificial intelligence and sustainability, specifically Daniel Bellini and Barbara Lissi. Subsequently, through purposeful email exchanges with the objective of specifically outlining the objectives of the study and coordinating logistical aspects with the aforementioned Barbara Lissi and Daniel Bellini, it was possible to arrange an appointment to carry out the planned interviews.

3.2.4 Background

Kering Eyewear represents a distinctive reality in the luxury eyewear scene, being part of the Kering Group, one of the world's largest conglomerates in the luxury sector[63].

Kering Eyewear is a luxury eyewear company that has experienced remarkable growth since its inception in 2014. The company attributes its success to the unwavering support of the Kering Group, a remarkable portfolio of 14 brands, and a team of highly skilled and experienced professionals in the industry.

This company stands out for its unique strategy of fully integrating the eyewear supply chain, from design to distribution, for some of the world's most prestigious fashion houses and luxury brands, such as Gucci, Saint Laurent, Bottega Veneta, Balenciaga, Alexander McQueen, and others. Kering Eyewear is characterised by its integrated strategy covering the entire value chain, from design to distribution, thus ensuring high-quality control and brand consistency across the various consumer touchpoints.

Founded in 2014, Kering Eyewear has revolutionized the concept of luxury eyewear, with an emphasis on quality materials, design innovation, and product exclusivity. Its mission is to enhance the heritage and identity of each of the group's brands through creations that reflect the style and values of each Maison, enriching the end user experience with products that combine craftsmanship, aesthetics and functionality.

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[63] Maison Kering Eyewear – Official website: https://www.kering.com/it/maisons/others/kering-eyewear/

Figure 7 – Logo of the company Kering

Figure 8 – The Kering Eyewear Logistic HUB (Distribution Center)

Figure 9 – One of Kering Eyewear Plants

Kering Eyewear is also committed to sustainable and responsible practices throughout its value chain, from the scouting of vendors and sourcing of materials to the production and distribution of its products, in line with the Kering Group's sustainability commitments. The company is constantly working to minimise its environmental impact and promote a more ethical and sustainable industry.

The company's strategy also focuses on technological innovation, for example through the use of artificial intelligence and machine learning to optimise processes such as the sizing of new product launches and the personalisation of the offer, as well as the use of advanced technologies to improve the sustainability of products and production processes (Murmura et al., 2021[64]).

The context in which Kering Eyewear operates is highly competitive and dynamic, characterised by a constant need for innovation and adaptation to market trends and consumer preferences. The luxury eyewear industry not only has to respond to the functional needs of customers but also reflect the exclusivity, style and values of the brands it represents.

Through its global distribution network, Kering Eyewear ensures a widespread presence in the most important markets, maintaining high standards of service for luxury customers worldwide. Collaboration with selected opticians and luxury boutiques enables it to offer a unique shopping experience that meets the expectations of a demanding and detail-oriented public.

Kering Eyewear is positioned as a leader in the luxury eyewear sector, thanks to its ability to combine innovation, sustainability and the exclusivity of the Kering Group brands[65].

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[64] Murmura, F., Bravi, L., & Santos, G. (2021). Sustainable process and product innovation in the eyewear sector: The role of industry 4.0 enabling technologies. *Sustainability*, *13*(1), 365.
[65] Bonato, G. (2021). The evolution of luxury brands presence in Chinese e-commerce market-Kering case. Venezia: Università di Venezia.

3.3   Results of the interview conducted with Daniel Bellini

In this interview with the IT manager of Kering Eyewear, one of the most critical processes for the company is analysed: the sizing of new product launches. According to the interviewee, the identification of the correct quantity to be launched involves a complex interaction, starting six months before the actual launch, between the sales, marketing and supply chain departments. Many factors make this estimation complex, but there are also factors that can be relied upon to make a correct prediction. Despite the inherent complexity of making accurate estimates, certain methodologies should still help refine these forecasts by minimising the margin of error over a historical series, often using metrics such as Mean Absolute Percentage Error (MAPE). Tools and processes were brought together in a significant collaborative effort involving sales, marketing and the supply chain to size product launches correctly and to try to have the right quantities available on the market when a new product is launched.

Continuing the interview, Daniel Bellini recounted how five years, as the process was solid and well-functioning, they tried to improve it through the use of artificial intelligence. They started doing machine learning on the historical performance of the glasses to understand how the artificial intelligence algorithm would behave at previous launches, exploiting all the data and information fed into the AI engine. In this way, an attempt was made to understand ex post how the prediction algorithm was able to perform. Subsequently, computer vision was incorporated into the artificial intelligence engine; however, the system in many cases gave results with low confidence and the gaps continued to be very wide. In other words, there was a degree of dissatisfaction with the results obtained up to that point. This led to the necessity of incorporating segmentation data into the engine, tracing and following the daily working methods of the teams responsible for sizing new product launches. This next phase, that involved the integration of segmentation, allowed the forecasts to be refined by analysing the data by market, product type and gender, which greatly improved the accuracy of the estimates. However, even with these innovations, the results obtained by artificial

intelligence did not surpass those based on human intuition and analysis.

In this way, the error became much lower and the figure in some cases started to be reasonable but still, despite all fine tuning, worse than the human prediction.

It was therefore reported that data scientists were then faced with a lack of additional ways of refining the system. Incorporating traditional market analysis processes for a new product launch, they essentially had to feed the AI with pre-processed data from the work of the three teams involved. This was, according to the IT manager, very laborious and did not provide the desired benefits.

However, despite the limitations, artificial intelligence found a practical application in supporting the sales teams in making more accurate forecasts of new products by providing access to comparable historical data. In particular, Daniel Bellini reported how AI proved reasonably reliable in finding similarities between glasses and shapes from the past that resembled the product intended for new launch.

Thus, when salespeople evaluate a new model of glasses and are asked to decide on the level of investment, they can obtain information on how similar spectacles in shape have performed in the past. This provides real help in making reliable forecasts and evaluating the performance of the new product, as well as predicting and estimating the various risks involved (such as the risk of cannibalization).

It was also pointed out in the interview that although this application is not a game changer for the company or its processes, it helps to reduce errors, with an impact on business performance (less inventory, more sales) and sustainability (avoiding the production of excess products that the market cannot absorb and the manufacture of economically unprofitable products, thus reducing avoidable CO_2 in the supply chain).

3.4   Results of the interview conducted with Barbara Lissi

In the context of the constantly evolving luxury fashion industry, an interview with Barbara Lissi, Global Head of Supply Chain, Manufacturing and Sustainability at Kering Eyewear, shed light on the possibility of integrating artificial intelligence (AI) into quality control process.

The Sustainability Manager outlined a vision in which AI not only increases operational efficiency, but also enables new ways of working within the industry.

In contrast to previous attempts to apply AI to predict optimal production quantities during new product launches - an area where human intervention was observed to remain crucial for accuracy and effectiveness - according to Barbara Lissi, the use of AI in quality control opens up important new perspectives. This change of approach highlights how AI can be particularly effective in standardised and repetitive tasks, such as checking the quality characteristics of spectacle lenses, where well-defined parameters such as thickness, colour and absence of defects (scratches or flaws) become key indicators.

The adoption of AI systems, capable of operating continuously for eight hours without showing signs of fatigue, unlike the human eye, represents a huge step forward in quality control efficiency. However, Barbara Lissi pointed out that, in the luxury fashion sector, there is still no technology that can fully match the precision and reliability of the human eye for such checks.

Nevertheless, Kering Eyewear is at the forefront of the development of such technology, with the aim of implementing it in processes where the creative element is not predominant.

The decision to develop this innovative solution stems from a desire to anticipate the future needs of the production process, also considering how companies in other sectors are adopting similar technologies to improve their quality standards.

Barbara Lissi also emphasised the importance of an accurate fine-tuning process, which will allow the machine to reach and, in some cases, exceed the precision of human eyes, guaranteeing superior quality control.

The prospect of increasing automation inevitably raises questions about the future of human labour in industry, especially regarding the need for specialisations that could be replaced by automated systems.

The conversation emphasised not only the potential of AI in improving the efficiency and quality of work, but also Kering Eyewear's vision of a future in which technological innovation coexists harmoniously with the irreplaceable value of human expertise, thus ensuring a balance between technological progress and the preservation of traditional skills in the luxury fashion industry. In other words, the Company will seek to prevent the risk of new technologies replacing human labour, which is considered an added value within the company to allow the same technologies to function as effectively as possible.

Barbara Lissi provided a comprehensive overview of the progress and challenges in the eyewear industry during the interview. She highlighted the introduction of sustainable traceability systems as a significant development. Despite the traditional reliance on craftsmanship in eyewear production, Barbara explained that Kering Eyewear has implemented an advanced system to track the manufacturing processes, materials used, and their origins.

This development results in important progress in the fashion industry, which is renowned for its creativity but has historically faced challenges in industrial connectivity and sustainable innovation.

In the field of accessories, traditional methods are commonly followed, but Kering Eyewear is trying to change this paradigm.
The integration of blockchain technology in 2018 was a transformative milestone for the company. Barbara emphasized, "It was a pivotal innovation for our sustainability strategy.

The V.I.R.T.U.S. project leverages this technology to establish a data exchange platform that is verified, integrated, reliable, trusted, unique, and secure.
This platform enables comprehensive and detailed traceability of all operations within the production system. Although this process is labour-intensive and time-consuming due to its high level of detail, it is imperative for ensuring sustainability (Figure 10).

The V.I.R.T.U.S. project, a private blockchain initiative, was designed to enhance the traceability of their products, as explained by Barbara Lissi. The complexity of traceability arises primarily from their reliance on an outsourcing business model, which grants significant flexibility but presents challenges in fully tracking the supply chain.

Figure 10 - *Verified, Integrated, Reliable, Trustworthy, Unique and Secure' data exchange platform[66]*

Barbara highlighted that although the process is complex and the immediate economic benefits may not seem obvious, Kering Eyewear's goal goes far beyond simple profit and loss calculations.

She stated, "Our aim is to surpass conventional objectives because we are committed to delivering a clear message: we manufacture products with full awareness of our actions. This aspiration transcends mere economic evaluation, as the accountability for our market offerings holds invaluable significance."

In conclusion, Barbara emphasized the company's ambitious environmental targets, stating, "We have set highly ambitious objectives, including the attainment of zero emissions by 2050." As a result, accurately delineating every aspect of their production chain is imperative. Their commitment involves ensuring that each process aligns with the stringent environmental criteria they have established, while also spearheading

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[66] The photo is available online at : https://www.keringeyewear.com/it/newsroom/2021/kering-eyewear-launches-the-blockchain-based-VIRTUS-Project

sustainable innovation that can serve as a model for the entire industry.

3.5 Discussion

In recent years, many companies operating in the field of Fashion Luxury have adopted models to predict or simulate the quantity of goods to be produced in order to optimize production (Fani et al., 2017[67]; Nunziatini et al., 2022[68]). Even within Kering Eyewear, there has recently been a reliance on new technologies and AI devices in order to create a balance between accessories produced, brought to market and then actually sold. Currently, there is still a lack of studies demonstrating the effectiveness of such procedures in providing a real benefit to companies, although the first published data appear encouraging. However, these results are still too fragmented and concern specific companies and specific product categories and, therefore, cannot be generalised to the entire world of fashion luxury.

For this reason, it was very important to listen to the voices of those who have launched similar initiatives within luxury companies considering a very specific category of goods, namely accessories and, even more specifically, sunglasses and optical frames.

The experience of Kering Eyewear is particularly relevant as, for some years now, this company has been trying to develop its own artificial intelligence engine capable of guiding production choices. During this time, those within the company who are responsible for the project have been able to observe the strengths and weaknesses of these new technologies. The strengths include the possibility of reducing forecast errors and increasing company performance, especially in terms of sustainability, by avoiding the production of too many accessories that the market would not be able to absorb.

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[67] Fani V., Bandinelli R., Rinaldi R., Optimizing production allocation with simulation in the fashion industry: a multi-company case study, in Proceedings of the 2017 Winter Simulation Conference, 2017,pp. 3917 – 3927.

[68] Nunziatini, A., Fani, V., Bindi, B., Bandinelli, R., & Tucci, M. (2022, December). Data-driven simulation for production balancing and optimization: a case study in the fashion luxury industry. In 2022 Winter Simulation Conference (WSC) (pp. 2957-2967). IEEE.

Indeed, the production of glasses that have no economic use in the market leads to high CO_2 emissions within the production chain. Optimizing production would avoid this risk with considerable benefits for the company in terms of corporate reputation and costs incurred (Daniel Bellini).

In the same vein are the reflections of Barbara Lissi, who argued that carrying out a production process in compliance with the parameters would make it possible to achieve performance targets such as that of achieving zero emissions by 2050.

In particular, the device created proved to be particularly effective in detecting similarities between the characteristics of current models and those produced in previous years that had been most successful in that they presented shapes that were highly appreciated by consumers. This especially gives sales teams advantages in effectively deciding how many pieces to purchase (Daniel Bellini).

CONCLUSIONS:

Areas of application, future prospects, and limitations

To conclude, the qualitative analysis, conducted through exploratory interviews with IT & Planning Manager Daniel Bellini and Global Head of Supply Chain, Manufacturing and Sustainability Barbara Lissi at Kering Eyewear, aimed to address the research question: "how can artificial intelligence support decision-making processes to optimize and coordinate operational activities in companies producing luxury goods?" .

Although some luxury fashion brands have recently tested artificial intelligence on an experimental basis and especially to optimize operations (Fani et al., 2017 [69]; Nunziatini et al., 2022 [70]), the experience of Kering Eyewear has so far not been as positive as the company's top management had hoped. In any case, the adoption of artificial intelligence in applications that will support the sales teams to make forecasts, will reduce errors and thus have an impact on company performance; reducing stocks and being more sustainable. In this way, all production will have an economical use in the market so as to avoid unnecessary CO_2 emissions in the production chain.

In any case, the company's position, as reported by the two executives interviewed, remains that it is optimistic about the possible future developments and applications of artificial intelligence, especially in the area of quality control. Certainly Kering EyeWear is a '*front runner*' in the luxury sector, as to our knowledge there are no other companies that are using these new technologies to support the quality control process. The company believes so much in this project that it plans in the future to increase the resources to be allocated to innovation by also looking for experienced

69 Fani V., Bandinelli R., Rinaldi R., Optimizing production allocation with simulation in the fashion industry: a multi-company case study, in Proceedings of the 2017 Winter Simulation Conference, 2017, pp. 3917 – 3927.
70 Nunziatini, A., Fani, V., Bindi, B., Bandinelli, R., & Tucci, M. (2022, December). Data-driven simulation for production balancing and optimization: a case study in the fashion luxury industry. In *2022 Winter Simulation Conference (WSC)* (pp. 2957-2967). IEEE.

professionals who know how to correct the inaccuracies observed so far and can identify the right technologies for each application case.

In addition, from an application perspective, the company should not exclude the possibility of extending the use of artificial intelligence to the blockchain system.
This would make it possible to standardise the monitoring of the production of the individual elements that contribute to the creation of the final product and thus of the individual companies that, under the coordination of Kering EyeWear, supply product parts or components.Each of these companies in the supply chain must, however, equip itself with an adequate IT infrastructure so that the operation of this system can progress further

In this way, important sustainability goals could be achieved with a significant return on investment even in intangible assets such as corporate reputation.
These data indicate that there is still a lot of confidence that artificial intelligence is an effective technology in process supervision, especially under conditions of uncertainty (Jarrahi et al., 2018), which in turn can drive innovation, and efficiency and secure new strategic opportunities in various sectors (Agrawal et al., 2019).

However, when choosing to rely on these state-of-the-art technologies, one must never forget the role of the human factor: it is people, in fact, who can make more or less appropriate use of the information coming from artificial intelligence, interpret it, enter new data to improve the predictions made (Bonato, 2021[71]) .
Any technological transition path must therefore always also consider the role played by people in making technologies truly efficient. This, however, in my opinion, does not exclude that, when artificial intelligence reaches high levels of maturity, the human contribution will be increasingly oriented towards higher value-added activities, the correct interpretation of data, the refinement of AI algorithms or any other creative and strategic activity.
At this point in time, AI applications in luxury companies are still at an embryonic

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71 Bonato, G. (2021). The evolution of luxury brands presence in Chinese e-commerce market-Kering case. Venezia: Università di Venezia.

maturity, but the growth and evolution of this technology is showing exponential rates and therefore one cannot but be optimistic about future applications, and their success.

In particular, the use of artificial intelligence in operational models can help companies address the unique challenges of luxury brands, such as reconciling luxury with sustainability, meeting consumer expectations for customized and high-quality products, and managing the complexities of the global supply chain.

The strength of the study is that it fits in with recent research that is trying to understand how artificial intelligence can be introduced into companies. Drawing on the experience of industries such as automotive, substantial progress can be made in the use of this technology to support decision-making processes, a field that is as yet little explored in the luxury sector (Agrawal, 2019; Dharma, 2024; Kumar et al., 2024).

However, the results obtained in this study, given the small number of respondents, cannot be considered definitive, nor can they be generalised to the full value chain of the Company to other companies in the sector. Kering Eyewear plans to proceed by investigating the applications of this new technology already realised, in other industrial sectors.

Certainly in order to strengthen the probability of success in the future, an effective strategy can be to work on the prerequisites of AI implementation. A structured and systematic approach is necessary to improve the probability of success. The company must be equipped with a robust IT infrastructure with dedicated server environments, its own data and sensors. This IT infrastructure not only enables the acquisition and management of data, but must also meet cyber security requirements.

To implement AI successfully, the data lock barrier must be overcome. It is necessary to ensure the presence and availability of all data, which can be obtained

through IoT, customer service and sales.

Furthermore,it is essential to create and train AI business translators, knowledgeable people from the business who are familiar with business operations and who, through detailed training, can identify and assess whether a given problem can be solved with artificial intelligence. These figures act as intermediaries between the operational teams and the data scientists who develop AI.

It is also crucial to reverse the current approach, which often sees the introduction of AI technologies without a proper assessment of business problems. The current general trend is to take this technology from the market and look for application areas within the business. AI must be the solution, not the starting point. Business-critical issues must be identified and the quality and availability of data assessed to trigger machine-learning projects or algorithms.

It might also be useful to undergo a Digital Innovation Hub to have an assessment using standard methodology, in order to assess how the company is positioned in that particular technology with respect to its market sector.

Finally, change management and proper communication regarding the AI are also crucial. AI is not a project that begins and ends, but an ongoing process. The skills of the people involved are necessary and must be constantly developed to avoid the new technology being perceived as a threat. A corporate culture that is open to change is crucial for the successful implementation of AI; so that the people involved in the project do not tend to keep their knowledge in order to avoid being replaced.

Potential applications

In Kering Eyewear's V.I.R.T.U.S project, the use of artificial intelligence would be an emblematic example of how advanced technologies can transform the industry. For example, through the use of blockchain technology, V.I.R.T.U.S, the Company manages to guarantee the analysis and vertical mapping of the value chain in an extremely capillary and articulated context; an ecosystem in which more than 20 direct suppliers move, who in turn collaborate with a long list of subcontractors and sub-subcontractors in Italy and abroad.

AI integration would enable automated data collection along the entire production and supply chain, recording information directly on the blockchain. Through the implementation of IoT sensors and system integrations, for example, it would be possible to monitor the production process in real time. This continuous monitoring helps to promptly identify any inefficiencies or deviations from established protocols, ensuring timely supervision and correction. As well as verifying the authenticity of the information entered by partners along the supply chain and compliance with the strict quality and sustainability standards required by the luxury brand.

As this technology is equipped with cyber security systems, it would not only ensure greater security and the inalterability of data, but also improve the efficiency of the process by reducing human errors and increasing the speed of information gathering.

By connecting the various IoT systems and leaving their management to artificial intelligence, business potential will open up that we cannot even imagine today.

Furthermore, using advanced data analytics algorithms, AI analyses the accumulated data to produce detailed reports that measure efficiency, monitor sustainability and verify compliance with vi genti regulations. These reports are essential for luxury brands seeking to maintain transparency and accountability towards their consumers.
Another issue of central importance is data security, especially when handling sensitive information related to luxury products. To this end, AI employs advanced security

protocols and encryption to protect data on the blockchain, preventing unauthorised access and manipulation.

In conclusion, the use of artificial intelligence in Kering Eyewear's V.I.R.T.U.S project would align perfectly with the brand's commitment to sustainable innovation, setting a new standard for the future of the luxury sector.

All these considerations take on importance especially within a company like Kering Eyewear that works mainly in outsourcing, making use of a long chain of suppliers that allow the company to always be creative.

In the outsourcing model, the supply chain tends to be extended and fragmented, which complicates the uniform collection of data. As previously stated, AI can automate and standardise data collection with respect to the entire supply chain, recording data securely. And furthermore, artificial intelligence can help overcome resource or expertise limitations of small and medium-sized enterprises, which are part of the supply chain, in implementing digital technologies

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