IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

Assessing the Integration of Artificial Intelligence and Sustainability in Transforming Luxury Fashion Consumption Patterns

Jagadishwar Reddy REDDYGARI
Independent Researcher
jagadeshwar87@gmail.com

Abstract: *The Luxury Fashion Industry (LFI) has witnessed a transformation of immense proportions due to the advent of AI technology and sustainability. The increasing awareness regarding the environment, advancement in technology, digitalization, and changes in consumers' needs and preferences have forced Luxury Fashion Brands (LFBs) to create innovative and sustainable business models. In this research paper, the emphasis will be on exploring the impact of AI technology and sustainability on LF consumption behavior and identifying how they influence consumer behavior, operational performance, and sustainable business growth. The research paper brings out the transformation witnessed by the LFI from its exclusive and technique-centric approach to digitization and sustainability. Moreover, this paper will discuss the advancements made in AI technology such as Machine Learning (ML), predictive analytics, virtual fitting rooms, recommendation engines, blockchain, and generative AI in the LFIs. In addition, the study identifies some of the critical barriers to AI implementation in regard to data privacy issues, cybersecurity concerns, ethical issues, high costs associated with implementation, algorithmic discrimination, and the lack of human innovation and craftsmanship. The literature review was carried out for the period between 2021 and 2025 to establish the link between AI and sustainability in the framework of LF consumption. Prior studies showed that the integration of AI not only helps improve sustainability levels but also increases customers' experiences. According to the results obtained in the course of the study, it becomes clear that the use of Artificial Intelligence (AI) along with sustainability in the business operations of the LFI determines its future success. However, in order to make innovations more efficient, it is necessary to strike a proper balance between technology and ethics. It can be assumed that the study findings will prove extremely valuable in future.*

Keywords: Artificial Intelligence (AI), Luxury Fashion Industry (LFI), Sustainable Fashion, Consumer Behavior, Machine Learning, Digital Transformation

I. INTRODUCTION

The evolution of LF over the last decade is attributed to environmental awareness, technology advancement, and customer preferences. LF clothes used to be a symbol of exclusiveness, craftsmanship, heritage, and quality. From 2018 onwards, the issue of climate change, wastage, poor labor practices, and overconsumption all around the world influenced customer perceptions regarding luxury brands. LF companies needed to incorporate sustainability and responsible practices such as ethics, transparency, and ethical sourcing. The fast growth of technology along with the development of AI made way for revolutionizing FI practices through digitization and technological innovation. Fashion AI adoption started rising after 2020 specifically in sustainability-centric innovations like predicting consumer needs and smart supply chain management[1].

The adoption of AI in the LFI between 2020 and 2023 was propelled by the joint effect of sustainability challenges and

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 9, May 2026 Impact Factor: 8.2

digital transformation after the pandemic[2]. The use of ML, big data analysis, and AI-driven recommendation systems helped luxury brands optimize their operations without negatively affecting the environment. AI technology facilitated predictions of consumer needs, minimized overproduction, decreased textile waste, and offered better consumer personalization. At the same time, sustainability emerged as the primary strategic focus for luxury brands amid the rising number of environmentally conscious consumers preferring ethical and sustainable products. Several studies conducted between 2022 and 2024 found that young consumers, especially Millennials and Gen Z consumers, were more inclined to patronize luxury brands that showed their environmental and technological commitment[3].

However, over the past few years, especially in 2025 and the current year of 2026, the interconnection between AI and sustainability has gained greater sophistication and impact when changing the way LF is consumed. LF houses have started applying the potential of generative AI, blockchain technology, VR, and intelligent automation to make their fashion sustainable and highly customized[4]. The use of AI can be observed while implementing circular fashion, designing digital fashion, developing innovative sustainable materials, checking for ethical sourcing and sustainability, and reducing carbon emissions. It should be noted that nowadays consumers expect from luxury brands not only high-quality goods but also the ability to show social and environmental responsibility. Moreover, the current state of research shows that sustainable AI usage has a positive impact on trust, buying intentions, and brand loyalty.

Additionally, it is evident that today's LFI is characterized by a major departure from conventional consumption driven by social hierarchy towards conscious and value-based consumption practices. Customers become more connected to the world of digital technologies, employing internet technology, AI fashion assistants, and other technological advancements while making sustainable choices regarding their purchases. Digital luxury experience, intelligent recommender systems, virtual dressing room experience, and AI-generated fashion designs are among some of the factors changing the face of consumers' interaction with the world of LF[5][6]. However, issues associated with data privacy, ethical use of AI technology, and its negative impact on human creativity and dependence on technology raise some questions in regards to its popularity and acceptance in the luxury market.

The purpose of this research paper is to examine how the adoption of AI and sustainability is changing consumer behavior in terms of LF consumption through an analysis of technology, sustainability, behavior change, and overall impact on the LFI.

II. BACKGROUND OF THE LUXURY FASHION INDUSTRY

LF constitutes one of the most elite industries in the world fashion market. The LFI is characterized by exclusivity, excellent craftsmanship, premium-quality materials, heritage, and high social status. Established LFBs have always been known to provide unique goods with an air of prestige, elegance, and wealth[7]. Categories include haute couture, designer clothes, luxury accessories, handbags, shoes, jewelry, cosmetics, and lifestyle items.

A. Evolution of Traditional Luxury Fashion

The history of the LF business can be traced back to craftsmanship, exclusiveness, heritability, and high-quality goods made to cater to wealthy consumers. Over time, luxury brands concentrated more on using handcrafting methods, restricting their products' supply, and providing quality materials in order to maintain their reputation and class[8]. Well-known fashion brands like Louis Vuitton, Gucci, and Chanel have gained international recognition due to timeless designs, craftsmanship, and heritage.

B. Shift from Exclusivity to Experiential Luxury

But, as time changes, LF is not only about purchasing expensive products; it is now about giving customers an extraordinary experience[9]. The new generation of luxury buyers want something special in their purchase process, emotion and authenticity. The marketers of luxury brands are targeting their customers through various ways based on CRM, digital engagement, and experiential marketing. Due to these changes, many innovations are taking place with the incorporation of technology like AI and virtual reality.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 9, May 2026 Impact Factor: 8.2

C. Growing Sustainability Concerns in Luxury Fashion

The FI has been identified as an important contributor to environmental pollution, wastage of textiles, carbon emissions, and unethical working conditions. The rising awareness among people about environmental damage due to climate change has forced LF houses to adopt sustainable practices in business operations[10]. Today, consumers not only look for ethical sourcing of raw materials, manufacturing using environmental-friendly methods, recycling packaging materials, and sustainable logistics operations in their fashion brands. Sustainable practices have become an integral part of the value proposition of LFBs.

D. Digital Transformation and Technological Innovation

The rapid advancement of digital technologies has led to a significant impact on the LFI. Digital technologies include the use of e-commerce platforms, social media, virtual fashion shows, AI recommendation algorithms, and smart retailing[11]. The adoption of these digital technologies allows luxury brands to improve their operations by means of inventory optimization, forecasting, and customer personalization[12]. The digital revolution has come at an extremely rapid pace due to the appearance of the COVID-19 pandemic.

E. Integration of Artificial Intelligence in Luxury Fashion

AI has emerged as an important force within the LFI. AI is being used in many fields, including predictive analytics, virtual fittings, chatbots, customized marketing tactics, smart manufacturing, and green logistics. LFBs use AI to reduce overproduction and wastage while enhancing customer experience and adopting sustainable practices[13][14]. The integration of AI technology and sustainability is leading to many interesting possibilities within the sphere of innovation, efficiency, and competitiveness in LF.

F. Objective of the study

- To assess the involvement of AI in sustainable luxury fashion.
- To explore shifting trends in luxury fashion consumption behaviour.
- To understand the consumer attitude towards AI-based sustainable fashion.
- To uncover the possibilities and obstacles of integrating AI technology.

III. EMERGENCE OF ARTIFICIAL INTELLIGENCE IN FASHION

The emergence of AI is regarded as one of the biggest revolutions ever introduced in technology which completely reshaped the FI through innovations in manufacturing, advertising methods, logistics, and even shopping habits of customers. At first, the traditional methods were used for predicting the demand and designing new clothes in the FI, as well as using conventional systems of retail. However, with the rise in personalization and digitalization, it became common to use AI tools to improve the efficiency of business operations and communication with customers in the industry. This revolution happened mainly because of the emergence of big data analysis, ML, and automation[15].

The use of AI in the LF sector is yet another example where this technology is used as an essential tool for ensuring enhanced performance and sustainability within the industry. Increasingly, LFBs have turned to recommendation engines, predictive analysis, chatbots, virtual styling services, and personalization solutions, which help the brands offer personalized experiences to their customers[16]. This ensures that firms gain insights into their customers' preferences, predict their behavior, and meet their demands. The use of demand forecasting technologies powered by AI helps reduce waste.

The evolution of AI has also brought about changes in the field of fashion design and product development. The advent of generative AI software has provided assistance to fashion designers in generating creative ideas for fashion, identifying fashion trends, and designing environmentally friendly products. The use of virtual try-ons and augmented reality software allows customers to have an immersive experience of products even before they buy them, thereby reducing product returns[17]. This, in turn, reduces any environmental damage that might be caused by transportation

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

and manufacturing additional products.

In addition, incorporation of AI technology in fashion supply chain management has enhanced transparency and efficiency. By combining AI with blockchain technology, LFBs can track the supply chain network regarding its sourcing, labor, and materials used. This is due to the increasing consumer preference for ethically manufactured products. In addition, incorporation of AI in the FI has fast-tracked digital transformation initiatives in the form of digital fashion experiences, virtual fashion show experiences, and smart retail environments[18]. Even with all these benefits, the rise of AI in the FI comes with some issues such as data privacy issues, cybersecurity concerns, AI algorithms bias, and the risk of losing human ingenuity and artistry. Regardless, AI still remains an integral part of fashion transformation through technology, sustainability, and consumer-oriented businesses in the global FI[19]. In this light, it is fair to say that the incorporation of AI has become an important driver of the future success of the LFI.

AI and sustainability have drastically changed the fashion value chain (Fig. 1) by making it more efficient, transparent, and environmentally friendly at all stages of the industry's operations. Before the use of AI technologies, fashion value chain management was a labor-intensive process that required human effort in all design, production, distribution, marketing, retail, and customer services stages. The introduction of AI technologies into the FI allows companies to automate processes and make more accurate predictions based on data analysis. AI-powered models help fashion brands calculate the level of demand, regulate inventories, reduce overproduction as well as waste generated by the use of fabric, resulting in the creation of a sustainable manufacturing process. Furthermore, such innovations as the development of virtual try-ons, advanced logistics systems, recommendation engines, and blockchain-powered technology can make the consumer experience better and sustain operations[20].

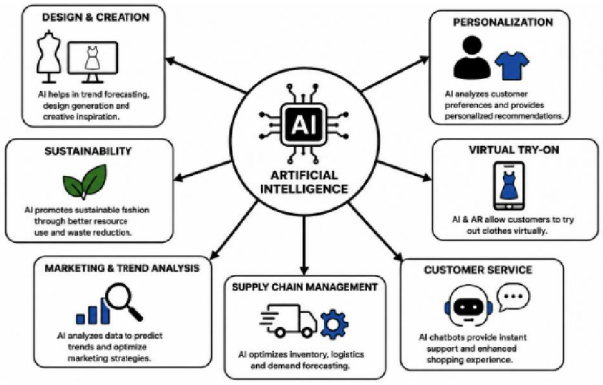

Fig. 1. Transforming the fashion value chain.

Table I contrasts traditional and AI-driven approaches to luxury fashion, showcasing the potential of AI to improve personalization, sustainability, operational efficiency, customer experience, decision-making, foster innovation, minimize waste, and contribute to the digital transformation of luxury fashion.

Table I : Analyzing the Impact of Artificial Intelligence on the Fashion Value Chain

AI Application in Fashion	**Traditional Fashion Industry**	**AI-Integrated Fashion Industry**	**Impact on Sustainability and Consumer Experience**
Design & Creation	Fashion designs were created manually based on designer experience and seasonal trends.	AI assists in trend forecasting, automated design generation, and creative inspiration using data analytics.	Reduces design time, improves innovation, and minimizes material waste through accurate forecasting.
Personalization	Brands offered general product recommendations for mass consumers.	AI analyzes customer preferences, purchase history, and behavior to provide	Enhances customer satisfaction, improves engagement, and encourages mindful purchasing

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 9, May 2026 Impact Factor: 8.2

		personalized recommendations.	behavior.
Virtual Try-On	Consumers physically visited stores to try products before purchasing.	AI and Augmented Reality allow customers to virtually try clothing and accessories online.	Reduces product returns, transportation emissions, and improves online shopping convenience.
Sustainability	Production often resulted in overproduction, textile waste, and excessive resource usage.	AI optimizes resource allocation, predicts demand accurately, and supports sustainable production practices.	Minimizes environmental pollution, reduces waste, and improves eco-friendly fashion operations.
Marketing & Trend Analysis	Marketing decisions were based on manual surveys and historical sales reports.	AI analyzes real-time market data, social media trends, and consumer behavior patterns.	Improves marketing efficiency, trend prediction accuracy, and customer targeting strategies.
Supply Chain Management	Supply chains relied on manual inventory control and traditional logistics systems.	AI automates inventory management, logistics optimization, and demand forecasting.	Reduces operational costs, prevents overstocking, and improves overall supply chain sustainability.
Customer Service	Customer support depended mainly on human representatives and limited-service hours.	AI-powered chatbots and virtual assistants provide instant 24/7 customer support.	Enhances customer interaction, improves service speed, and increases customer satisfaction.
Consumer Shopping Experience	Shopping experiences were mainly physical and less technologically interactive.	AI creates smart retail experiences through virtual shopping, AI stylists, and personalized services.	Improves convenience, digital engagement, and modern luxury shopping experiences.
Decision-Making Process	Business decisions were based on assumptions and limited market insights.	AI supports data-driven decision-making using predictive analytics and ML.	Increases business efficiency, accuracy, and long-term sustainability planning.
Fashion Industry Growth	Growth depended mainly on brand reputation and traditional retail expansion.	AI enables digital transformation, innovation, and global online consumer connectivity.	Strengthens competitive advantage and supports future sustainable fashion development.

IV. CHALLENGES - IN OBTAINING A SUSTAINABLE AI SOLUTION FOR LUXURY FASHION.

Fig. 2 shows the combination of AI and sustainability in the LFIs brings along multiple benefits; nonetheless, there are also several challenges that are faced by firms and consumers as well as by the entire FI. The main challenge is presented by the issue of combining innovations in technology with the fundamentals of LF, such as craftsmanship, uniqueness, creativity, originality, and the human element[21]. Consumers in the LFI usually see LF to be related to emotional aspects, authenticity, and craftsmanship. Excessive use of automated solutions via the means of AI can lead to problems related to losing the originality of design and human creativity.

The other major problem that AI-based systems face is that of data privacy and security. Such a challenge comes about because of the extensive need for the analysis, storage, and gathering of large amounts of data from consumers in relation to their buying behavior, tastes, and purchase histories, among others [22]. The major issue in concern is that this could be applicable in cases involving luxury consumers, where data privacy and exclusivity are major concerns. Recommendation engines and facial recognition technologies present ethical problems regarding the same.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

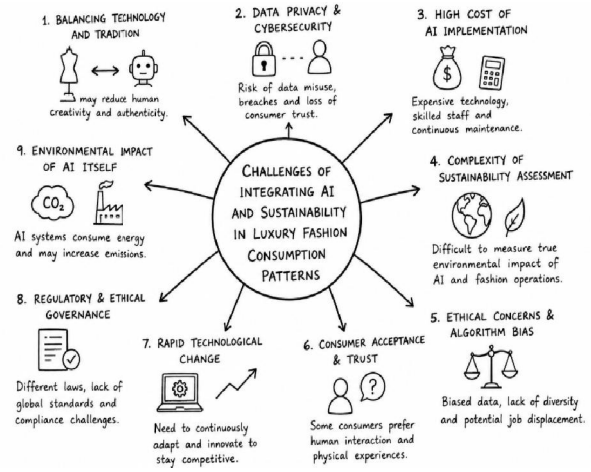

Fig. 2. Drawback of Sustainable AI in Fashion

Moreover, the expensive nature of adopting AI technology is another important hurdle that must be considered. Investing in the development of an AI system requires heavy capital spending, including money for sophisticated software and hardware, secure cloud services, cybersecurity, and specialized technicians. Although large luxury firms can afford this kind of technological adoption, small and new LF firms struggle with the cost of investing in it[23][24]. Moreover, sustaining an AI system and keeping up with technological advancements involves ongoing expenses.Another problem associated with sustainability assessment in the LFI is also quite complex. Estimating the actual effects on the environment and society in terms of sustainability efforts made using AI technology may not be easy since sustainability comprises several aspects including carbon footprint, energy use, waste generation, ethical treatment of workers, water usage, and so forth[25]. While AI can help enhance production processes and eliminate waste, it should be noted that AI technologies require substantial amounts of energy.

Ethical issues related to algorithmic bias are another challenge that comes from the use of AI technologies. Since algorithms require historical data, any bias contained within such information may affect the decisions made by AI software. Thus, if an AI program used by companies in the FI is biased, it can create problems by limiting diversity or failing to properly address the needs of different customers. The issue of automation replacing people is another ethical concern in regard to AI[26]. With more automated processes, fewer jobs will be available to FI workers. The consumer acceptance and trust regarding AI-enabled LF products is yet another difficulty. While it is true that younger generations tend to be more welcoming toward technological advancements, there are plenty of luxury consumers who would rather have a personal experience with the product than shop online or via any other technology[27]. Moreover, since emotional engagement plays such a significant role in LF products, excessive reliance on automated systems might hinder it.

Moreover, apart from all the challenges mentioned above, rapid development of technologies leads to certain issues that concern innovation and adoption. Luxurious fashion brands will always need to adjust their use of technology, but there may be an issue of their losing their relevance because of this. Heavy dependency on technological solutions might create certain risks for the organization in case of failure or disruption. However, finally, global regulatory and ethical governance issues complicate using AI and implementing sustainable initiatives in LFI. Every country has its legislation, policies and norms concerning things such as data protection, sustainable actions and AI. Therefore, international LFBs need to take into account this fact when trying to implement sustainable initiatives and technologies in their work internationally[28]. Besides, lack of global ethics for the deployment of AI complicates the situation even further.

DOI: 10.48175/IJARSCT-37225

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

V. LITERATURE REVIEW

Ahmed Rania, Ahmed Eman, Ahmed Elbarbary, Darwish Ashraf, and Hassanien Aboul Ella (2025), in the research paper titled "A Systematic Review," have explored the impact of generative AI and metaverse technologies on the FI worldwide. The paper highlighted that AI-enabled fashion designing, virtual fashion experience, and digital retailing enhance customer interactions and efficiency. It was concluded by the researchers that generative AI and metaverse technologies can play a crucial role in the future sustainability of fashion manufacturing, marketing, and luxurious consumption practices [29].

In accordance with Leo Ramos, Francklin Rivas-Echeverría, Anna Gabriela Pérez, and Edmundo Casas (2023), in their work titled ".A Review from 2010 to 2022", AI has come out as an important technology for sustainability improvement in the FI. In their research paper, it was stated that AI technologies like predictive analytics, ML, intelligent inventory management systems, and supply chain automation would enable the reduction in overproduction, textile waste, and environmental pollution. On the other hand, the researchers mentioned some drawbacks associated with AI applications in the FI such as high cost, ethical issues, and poor industrialization[30].

The paper discusses the Strengths and Weaknesses by Saponaro, Mariapaola, Le Gal, Diane, Gao, Manjiao, Guisiano, Matthieu, Maniere (2022), and Ivan Coste in respect with AI in relation to the enhancement of customers' online and offline experiences, along with some methods to evaluate them. These methods would consist of research that may or may not be based on interviews. The emergence of AI technology in the retail industry has become an essential element of customers' experience. By analyzing the tools available for extracting relevant information from them, they attempt to give guidance on how to use them for the benefit of businesses and customers, whether it is through their online or offline shopping experiences. Therefore, aim at giving insights on how future customer experience can be enhanced with the help of these advancements [31].

In this paper, Nilanjana Bairagi and Suparno Goswami, (2021) fashion consumption and disposability amid the COVID-19 epidemic among Indian undergraduate and postgraduate students, representing a significant part of Gen Z, are being examined. In order to accomplish this aim, a non-probability sampling technique known as purposive sampling was used to conduct research on Indian students belonging to different fields of study. This epidemic has not affected the fashion consumption of young Indian students aged between 20 and 30 years. Online shopping has been the recent success that consumers have experienced during this epidemic. Some of the reasons why people dispose their clothes include loose sewing on the seams, lack of buttons, poor fitting, faded colors, appearance of holes, pilling of clothes, shift in fashion trends, size problems, and allergic contact dermatitis[32].

The following literatures are summarized in Table II mentioned below.

Table 2: Summary Literature Review

Author(s) & Year	Title of the Study	Research Focus	Methodology	Key Findings	Strengths	Weaknesses / Limitations	Comparative Analysis
R. Ahmed, E. Ahmed, A. Elbarbary, A. Darwish & A. E. Hassanien (2025)	Fashion Industry in the Age of Generative AI and Metaverse: A Systematic Review	Impact of generative AI and metaverse technologies on the FI	Systematic review	AI-powered fashion design, virtual experiences, and digital retailing improve customer interaction and business efficiency	Highlights future digital transformation and innovative customer engagement strategies	Limited practical implementation evidence and long-term industrial analysis	Unlike sustainability-focused studies, this research emphasizes future technological advancements, metaverse integration, and digital consumer experiences

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 9, May 2026 Impact Factor: 8.2

L. Ramos, F.Echeverría, A. Gabriela Pérez & E. Casas (2023)	AI and Sustainability in the Fashion Industry: A Review from 2010 to 2022	Role of AI in improving sustainability within the FI	Systematic literature review	AI technologies such as predictive analytics, ML, smart inventory systems, and automated supply chains help reduce overproduction, textile waste, and environmental pollution	Strong focus on sustainability improvement and operational efficiency through AI	High implementation cost, ethical concerns, and limited industrial adoption of AI technologies	Compared with other studies, this research focuses more on sustainability and operational management rather than consumer behavior or virtual experiences in LF
M. Saponaro, D. L. Gal, M. Gao, M. Guisiano, Maniere & I. Coste (2022)	AI and Customer Experience Enhancement in Retail Industry	AI applications for improving online and offline customer experiences in retail	Research-based review including interview methods	AI technologies improve customer experience, personalization, and information extraction in retail environments	Strong focus on customer experience enhancement and practical AI applications in retailing	Limited direct focus on sustainability and LF-specific practices	Unlike operational sustainability studies, this research concentrates more on AI-driven customer interaction and retail experience enhancement in both online and offline environments
N. Bairagi & S. Goswami (2021)	Fashion Consumption and Disposal Pattern During COVID-19 Pandemic Among Indian Generation Z	Fashion consumption and garment disposal behavior among Indian students during COVID-19	Non-probability purposive sampling and survey analysis	Online shopping increased during the pandemic, while garment disposal reasons included poor fitting, seam slippage, color fading, and fashion trend changes	Provides real consumer behavior insights during a global crisis	Limited sample focused only on Indian undergraduate and postgraduate students	Compared with AI-focused studies, this research mainly examines consumer consumption and disposal behavior rather than technological innovation or sustainability systems

A. Research Gap

According to the research, AI has significantly influenced digitization, customer experience, and sustainability in the financial industry. However, the interplay between AI use, sustainability policies, and consumer behavior has received scant attention from researchers. The impact of AI and sustainability on LF consumption behavior has received surprisingly little attention from researchers. Additionally, there is a dearth of research that takes into account shifts in

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

consumer behavior in LF when analyzing technical innovation and sustainability. To address this knowledge vacuum, this research investigates how artificial intelligence (AI) and sustainability (SS) influence LF consumption habits.

VI. CONCLUSION

The integration of AI with the concept of sustainability has brought about a paradigm shift for the LFI in terms of changing the firm's operations, consumer behavior, and sustainable consumption. In addition to all this, the results suggested that LF firms are utilizing the latest technologies offered by AI such as ML, predictive analytics, virtual try-on, blockchain technology, intelligent inventory management, and generative AI. The adoption of these technologies helps improve efficiency, customer experience, and sustainability in doing business.

There are limitations to this study. It uses secondary sources that cover mostly the literature from the year 2021 to 2025 that relate to AI, sustainability, and LF. Considering that technology and sustainable fashion are fast-growing, there could be other developments not covered by this study. In addition, this study mainly targets the LFI, thus restricting its applicability to the whole FI. However, future research could conduct more empirical work and even compare different industries in order to gain more insight regarding the impact of AI on sustainability.

Moreover, the findings indicated that the LF sector has been moving from the phase of exclusivity and techniques to becoming technology-driven and consumer-centric. The literature review and comparative analysis have confirmed that AI has become an important technology for sustainable fashion due to improved customer experiences and effective management operations. However, it is important to ensure responsible use, ethical management, and further development of AI technology.

REFERENCES

[1] I. Amed *et al.*, "The State of Fashion 2020: Coronavirus Update," 2020.

[2] M. Vignesh and K. Thanesh, "A Review on Artificial Intelligence (AI) is Future Generation," *Int. J. Eng. Res. Technol.*, vol. 8, no. 7, 2020, doi: 10.17577/IJERTCONV8IS07010.

[3] E. Kouslis *et al.*, "AI in fashion: a literature review," *Electron. Commer. Res.*, vol. 25, no. 5, pp. 4071–4102, Oct. 2025, doi: 10.1007/s10660-024-09872-z.

[4] S. S. Sengar, A. Bin Hasan, S. Kumar, and F. Carroll, "Generative artificial intelligence: a systematic review and applications," *Multimed. Tools Appl.*, vol. 84, no. 21, pp. 23661–23700, 2025, doi: https://doi.org/10.1007/s11042-024-20016-1.

[5] M. Milanesi, S. Guercini, and A. Runfola, "Let's play! Gamification as a marketing tool to deliver a digital luxury experience," *Electron. Commer. Res.*, vol. 23, no. 4, pp. 2135–2152, Dec. 2023, doi: 10.1007/s10660-021-09529-1.

[6] R. Palwe, "The Role of User Experience Design in Advancing Digital Sustainability," *Int. J. Sci. Res.*, vol. 14, no. 10, October, pp. 1168–1176, 2025, doi: 10.21275/SR251021070714.

[7] T. (Tripp) Liu, C. S. L. Tan, and C. Quintero Rodriguez, "Virtual reality in the luxury fashion industry: a systematic literature review," *Spanish J. Mark. - ESIC*, vol. 29, no. 3, pp. 312–329, Jun. 2025, doi: 10.1108/SJME-07-2023-0203.

[8] L. Jia, "The Application of Traditional Chinese Elements in Luxury Fashion Goods," *J. Text. Sci. Fash. Technol.*, vol. 1, no. 4, Dec. 2018, doi: 10.33552/JTSFT.2018.01.000519.

[9] J. E. Kofi, "Machine Learning-Based Framework for Predicting Customer Satisfaction in Customer Relationship Management Systems," in *2026 International Conference on Communication, Computing and Emerging Technologies (IC3ET)*, Vasai, India: IEEE, 2026, pp. 602–607, April. doi: 10.1109/IC3ET64989.2026.11467334.

[10] N. Athwal, V. K. Wells, M. Carrigan, and C. E. Henninger, "Sustainable Luxury Marketing: A Synthesis and Research Agenda," *Int. J. Manag. Rev.*, vol. 21, no. 4, pp. 405–426, Oct. 2019, doi: 10.1111/ijmr.12195.

[11] A. Parupalli, "Optimizing Customer Engagement in Multi-source E-commerce Retail Datasets Using Artificial

Intelligence-Based Efficient Techniques," in *2025 5th International Conference on Artificial Intelligence and Signal Processing (AISP)*, Vijayawada, India: IEEE, 2025, pp. 1–7, November. doi: 10.1109/AISP68263.2025.11396229.

[12] A. Khan, T. Khan, and M. Ahmad, "The role of technological innovation in sustainable growth: Exploring the economic impact of green innovation and renewable energy," *Environ. Challenges*, vol. 18, p. 101109, Apr. 2025, doi: 10.1016/j.envc.2025.101109.

[13] B. Alexander, *Customer Experience in Fashion Retailing*. London: Routledge, 2024. doi: 10.4324/9781003378099.

[14] C. Patel, "Generative AI for Personalized Marketing and Customer Experience in E-Commerce," *Int. J. Emerg. Res. Eng. Technol.*, vol. 7, no. 1, pp. 12–19, Jan, 2026, doi: https://doi.org/10.63282/3050-922X.IJERET-V7I1P103.

[15] K. Vavrová, "Fashion design and fashion industry: The impact of social media on customer behaviour and its current role in the fashion industry," *Archit. Pap. Fac. Archit. Des. STU*, vol. 29, no. 3, pp. 39–45, Sep. 2024, doi: 10.2478/alfa-2024-0016.

[16] P. K. Gupt and D. A. Pal, "Predictive Analytics for Fashion Retail A Data Mining Approarch," *Int. J. Innov. Sci. Res. Technol.*, 2025.

[17] W. Shi, W. Wong, and X. Zou, "Generative AI in Fashion: Overview," *ACM Trans. Intell. Syst. Technol.*, Feb. 2025, doi: 10.1145/3718098.

[18] H. Singh, G. Jain, N. Kumar, L. Hashimy, and A. Shrivastava, "Blockchain Technology in the Fashion Industry," *J. Electron. Commer. Organ.*, vol. 20, no. 2, pp. 1–21, Aug. 2022, doi: 10.4018/JECO.300303.

[19] FashionUnited, "Global fashion industry statistics - International apparel," *Fash. Int. Fash. Ind. Netw.*, 2020.

[20] "Tech-Driven Fashion Navigating the Opportunities and Challenges of Digitalization," *Appl. IT Eng.*, vol. 3, no. 1, pp. 1–10, Jan. 2025, doi: 10.25163/engineering.10208.

[21] J. Dou, "The application and challenges of artificial intelligence in the fashion and luxury industry," *Appl. Comput. Eng.*, vol. 42, no. 1, pp. 90–96, Feb. 2024, doi: 10.54254/2755-2721/42/20230694.

[22] J. Zhao, "Innovative Applications and Challenges of AI in the Fast Fashion Industry," *Adv. Econ. Manag. Polit. Sci.*, vol. 128, no. 1, pp. 158–165, Dec. 2024, doi: 10.54254/2754-1169/2024.18684.

[23] D. Casciani and E. D'Itria, "Fostering Directions for Digital Technology Adoption in Sustainable and Circular Fashion: Toward the Circular Fashion-Tech Lab," *Systems*, vol. 12, no. 6, p. 190, May 2024, doi: 10.3390/systems12060190.

[24] A. Parupalli and H. Kali, "An In-Depth Review of Cost Optimization Tactics in Multi-Cloud Frameworks," *Int. J. Adv. Res. Sci. Commun. Technol.*, vol. 3, no. 5, June, pp. 1043–1052, 2023, doi: 10.48175/IJARSCT-11937Q.

[25] A. Andrés, "Role of Sustainability and Ethics in Fashion Design and Production in South America," *Int. J. Fash. Des.*, vol. 3, no. 1, pp. 12–23, Mar. 2024, doi: 10.47604/ijfd.2388.

[26] M. Jayakumari, J. Hayavadana, K. Srinivasulu, E. K. Murthy, S. Umamageshwari, and M. Vijayasarathy, "Ethical Issues in Fashion Industry," *African J. Biomed. Res.*, 2024.

[27] Y. Cao, "Research on the Application of Generative Artificial Intelligence in Sustainable Fashion Design Models from the Perspective of Design Studies," *Stud. Soc. Sci. Res.*, vol. 6, no. 3, p. p14, Jul. 2025, doi: 10.22158/sssr.v6n3p14.

[28] L. Costin and L. Barnes, *Fashion Marketing*. Cham: Springer Nature Switzerland, 2025. doi: 10.1007/978-3-031-82571-2.

[29] R. Ahmed, E. Ahmed, A. Elbarbary, A. Darwish, and A. E. Hassanien, *Fashion Industry in the Age of Generative Artificial Intelligence and Metaverse: A systematic Review*. 2025. doi: 10.48550/arXiv.2505.17141.

[30] L. Ramos, F. Rivas-Echeverría, A. G. Pérez, and E. Casas, "Artificial intelligence and sustainability in the fashion industry: a review from 2010 to 2022," *SN Appl. Sci.*, vol. 5, no. 12, p. 387, Dec. 2023, doi:

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

10.1007/s42452-023-05587-2.

[31] M. Saponaro, D. Le Gal, M. Gao, M. Guisiano, and I. C. Maniere, "Challenges and Opportunities of Artificial Intelligence in the Fashion World," in *2018 International Conference on Intelligent and Innovative Computing Applications (ICONIC)*, IEEE, Dec. 2018, pp. 1–5. doi: 10.1109/ICONIC.2018.8601258.

[32] N. Bairagi and S. Goswami, "Fashion Consumption and Disposal Patterns among College Students during COVID-19 in India," *NIFT J. Fash.*, 2022.