



INFLUENCE OF DIGITAL TECHNOLOGY ON FASHION DESIGNING AND CREATIVE INNOVATION

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ABSTRACT

Digital technology has become a major force in transforming contemporary fashion designing and creative innovation. The integration of computer-aided design (CAD), 3D virtual prototyping, artificial intelligence (AI), augmented reality (AR), virtual reality (VR), digital textile printing, and data-driven trend forecasting has changed the traditional processes through which fashion designers develop, visualize, evaluate, and communicate new ideas. Recent research indicates that digital technologies can accelerate design development, support experimentation, reduce dependence on physical samples, improve visualization, and create new opportunities for sustainable and innovative fashion practices. This study aims to examine the influence of digital technology on fashion designing and creative innovation, with particular attention to designers' creative practices, design efficiency, experimentation, and development of innovative fashion products. A quantitative research approach will be adopted using a descriptive survey design. Data will be collected from fashion design students, teachers, and professional designers through a structured questionnaire. Descriptive statistics, including frequencies, percentages, means, and standard deviations, will be used to analyze the data. The study is expected to demonstrate that digital technologies positively influence fashion designers by expanding creative possibilities, improving visualization and experimentation, facilitating rapid modification of designs, and supporting more efficient product development. However, challenges such as technological costs, lack of digital skills, training requirements, and concerns about overdependence on technology may influence effective adoption. The study concludes that digital technology can function as an important creative partner in contemporary fashion design when combined with human creativity, professional knowledge, and critical design thinking.

KEYWORDS: *Digital Technology, Fashion Designing, Creative Innovation, Artificial Intelligence, 3D Virtual Prototyping, CAD, Digital Fashion, Creativity, Fashion Innovation, Digital Design*

INTRODUCTION

The fashion industry is experiencing significant transformation as digital technologies increasingly become integrated into creative and design processes. Traditionally, fashion designing depended heavily on manual sketching, physical pattern development, fabric experimentation, sample production, and face-to-face communication. Although these traditional methods remain important, contemporary designers increasingly use digital tools to visualize ideas, develop patterns, simulate garments, experiment with materials, predict trends, and communicate designs. Ali, W., Ko, K. W., Ahmed, F., Lim, J. H., & Choi, K. H. (2025). found that Digital transformation has therefore changed not only the technical aspects of fashion production but also the ways in which designers generate and develop creative ideas. Recent research identifies artificial intelligence, 3D modelling, virtual and augmented reality, blockchain, and other digital innovations as important technologies influencing modern fashion design and industry practices. Computer-aided design (CAD) is one of the most established digital technologies used in fashion. CAD allows designers to produce



detailed sketches, technical drawings, patterns, colour combinations, textile designs, and garment specifications with greater speed and precision. Unlike traditional paper-based processes, digital design allows designers to modify shapes, colours, proportions, textures, and construction details without starting the design from the beginning. This flexibility encourages experimentation and enables designers to explore a wider range of creative alternatives. Consequently, digital tools can support a more iterative design process in which designers continuously test, evaluate, modify, and improve their concepts. Ali, W., Ko, K. W., Ahmed, F., Lim, J. H., & Choi, K. H. (2025).found that. Three-dimensional digital design has further expanded these possibilities. 3D fashion software enables designers to create virtual garments and visualize their appearance on digital avatars before producing physical samples. This allows designers to evaluate silhouette, fit, colour, fabric behaviour, and garment construction in a virtual environment. Research published in 2024 indicates that 3D virtual prototyping can enhance spatial visualization, critical thinking, problem-solving, and creativity among fashion design studentsTherefore, 3D technology is not simply a production tool; it can also become an important creative instrument that encourages designers to experiment with new forms and ideas.The influence of digital technology is particularly significant in relation to creative innovation. Creativity in fashion involves generating original ideas and transforming them into aesthetically and functionally meaningful products A recent study examining global fashion design trends found that digital technology influences fashion elements such as colour, prints, graphics, textiles, styles, and design details. This demonstrates that digitalization can influence both the process of creating designs and the visual characteristics of contemporary fashion.Artificial intelligence represents another important development in fashion designing. AI-based systems can analyze large amounts of fashion data, identify patterns and trends, generate visual concepts, support colour and material selection, and assist designers during the ideation stage.

This suggests that the future of fashion design may increasingly involve collaboration between human designers and intelligent digital systems. Balloni, E., Pietrini, R., Sasso, M., Frontoni, E., & Paolanti, M. (2025).explained that. Virtual and augmented reality technologies are also creating new possibilities for fashion creativity. Designers can use immersive technologies to visualize garments in three-dimensional environments, develop virtual fashion experiences, create digital collections, and present designs without relying exclusively on physical garments. Balloni, E., Pietrini, R., Sasso, M., Frontoni, E., & Paolanti, M. (2025) Explained thatThe increasing relationship between fashion and immersive technologies has also been associated with sustainability because virtual visualization and digital sampling can reduce the need for some physical prototypes. Digital fashion and metaverse-based fashion environments have further expanded the concept of clothing beyond physical garments, allowing designers to create fashion products that exist primarily in digital spaces. Digital technology also has important implications for sustainable fashion innovation. Conventional fashion design may require repeated physical samples, material consumption, transportation, and waste during product development. Digital prototyping can allow designers to evaluate designs virtually before producing physical samples. Recent research on 3D digital technologies has highlighted their potential to modify traditional fashion design practices and support sustainability within circular fashion systems.



Similarly, research published in 2026 found that virtual prototyping can reduce material costs and decrease the number of physical prototypes, although the environmental benefits depend partly on the energy requirements of digital infrastructure. Digital technology is also influencing upcycling and sustainable creative practices. Designers can use 3D digital systems to experiment with alternative garment configurations, modular designs, and redesign possibilities before physically reconstructing garments. For example, research on 3D digital technology and apparel upcycling found that digital systems can support the development of modular redesign approaches and improve creative exploration. These developments demonstrate that technology can contribute not only to faster fashion design but also to new approaches to sustainability and resource efficiency. Despite these advantages, digitalization also creates challenges for fashion designers. The acquisition of advanced software and hardware can be expensive, while effective use of digital technologies requires specialized technical skills. Designers and students may require substantial training before they can use 3D software, AI systems, digital pattern-making tools, and immersive technologies effectively. Research on 3D fashion design education has identified challenges including the learning curve associated with digital tools and the time required to manage iterative digital design processes. In addition, excessive dependence on automated systems may raise concerns about originality, authorship, creative independence, and the preservation of human-centred design thinking.

Instead, it can be understood as an additional creative environment in which designers combine technical capabilities with imagination, cultural knowledge, aesthetic judgment, and professional experience. The most effective digital fashion design practices are likely to emerge when technology supports rather than dominates human creativity. De Wet, A. J. C., & Smal, D. (2024) explains that. The growing use of digital technologies makes it necessary to examine their actual influence on fashion designers and students. Understanding whether digital tools genuinely improve creativity, innovation, design efficiency, experimentation, and problem-solving can provide valuable information for fashion education and industry practice. This study therefore focuses on the influence of digital technology on fashion designing and creative innovation. It investigates how digital tools affect creative processes, design development, experimentation, and innovation, while also considering challenges associated with digital technology adoption.

RESEARCH OBJECTIVES

1. To examine the influence of digital technology on contemporary fashion designing and creative processes.
2. To investigate the role of digital tools such as CAD, 3D modelling, AI, AR, and VR in enhancing creativity and innovation in fashion design.
3. To identify the major benefits and challenges associated with the adoption of digital technology in fashion designing.



RESEARCH QUESTIONS

1. How does digital technology influence contemporary fashion designing and creative processes?
2. To what extent do digital design tools enhance creativity and innovation among fashion designers and students?
3. What are the major benefits and challenges of using digital technology in fashion designing?

LITERATURE REVIEW

Recent literature demonstrates that digitalization is reshaping fashion design through the integration of AI, CAD, 3D modelling, AR, VR, digital printing, data analytics, and virtual fashion. Liu et al. highlight that digital transformation has significantly influenced fashion marketing and design, particularly through AI, 3D modelling, virtual reality, augmented reality, and virtual fashion shows. De Wet, A. J. C., & Smal, D. (2024). Explains that These technologies can improve efficiency, reduce costs, and provide new opportunities for product design and consumer engagement. The development of 3D virtual design has received particular attention in fashion education. Papahristou and Zolota Tatsi (2024) found that 3D design knowledge can improve spatial visualization, critical thinking, problem-solving, and sustainability awareness while enabling students to explore virtual garment design and fabric simulation. This indicates that digital design tools can contribute directly to creative skill development. Digital technologies are also connected with sustainable fashion design. A 2023 literature review on immersive technologies found that AR and VR are increasingly relevant to fashion sustainability and digitalization. Similarly, research on digital technologies in sustainable textile and clothing development identifies CAD/CAM, AI, AR, VR, IoT, RFID, digital textile printing, 3D simulation, and 3D printing as important components of digital transformation in the textile and fashion sector. AI is increasingly being incorporated into fashion design and creative decision-making. Recent research shows that AI-supported systems can analyze fashion images, detect trends, identify colours and products, and support designers in making context-sensitive creative decisions.

This human-technology collaboration provides opportunities for designers to combine computational analysis with their own professional creativity. Digital technology can also contribute to sustainable and circular fashion. Periyasamy, A. P., & Periyasami, S. (2023). found that. Liang, Dong, and Suh (2025) reviewed the application of 3D digital technologies in fashion design practices and examined their implications for circular fashion and sustainability. Choi's research similarly demonstrates how 3D digital technology can support upcycling through modular redesign systems, providing designers with new opportunities for experimentation and sustainable creativity. Overall, the literature suggests that digital technology can enhance fashion creativity by increasing visualization, experimentation, flexibility, speed, and access to information. Papahristou, E., & Tatsi, N. Z. (2024) Elaborated on. However, successful digital transformation requires appropriate training, technological infrastructure, financial investment, and a balance between technological assistance and



human creativity. Ishibashi, Y., Zhu, J., Gernoux, G., Yu, Y., Suh, M. J., Isgrig, K., ... & Chien, W. W. (2025).found that. Digital technology has become an important component of contemporary fashion designing, changing the way designers generate ideas, visualize garments, experiment with materials, and communicate creative concepts. The development of computer-aided design (CAD), 3D garment simulation, artificial intelligence (AI), virtual reality (VR), augmented reality (AR), digital textile printing, and other digital platforms has moved fashion design beyond conventional handdrawing and physical sampling. Recent literature describes digital fashion as an area involving the virtual creation, production, and representation of fashion through computer-aided technologies.

Team, K., Du, A., Gao, B., Xing, B., Jiang, C., Chen, C., ... & Lin, Z. (2025 Explains that A systematic review of 386 publications found that design, fashion, technology, social media, sustainability, and computer-aided design are major themes within recent digital-fashion research. This indicates that digital technology is not simply a technical addition to fashion but is increasingly influencing the broader creative and design ecosystem. One of the most important contributions of digital technology to fashion design is the improvement of design visualization and experimentation. Traditional fashion development often requires designers to create physical samples before they can evaluate the appearance and fit of a garment. Digital 3D technologies provide an alternative by allowing designers to construct garments virtually and observe their shape, proportions, colours, textures, and fit on digital avatars. Papahristou and Zolota Tatsi (2024) reviewed the role of 3D design knowledge in fashion education and emphasized its relevance to digital transformation and creativity. Their work demonstrates that 3D virtual design can provide fashion students with new ways to understand garment construction and develop creative concepts. Through virtual visualization, designers can make changes rapidly and compare different versions of a garment without producing a new physical sample for every modification. This flexibility can encourage experimentation and make the creative process more iterative. The literature also emphasizes the relationship between 3D digital design and creative innovation. Digital environments enable designers to move between abstract ideas and visible design outcomes more quickly. Instead of relying exclusively on imagination and physical prototypes, designers can immediately visualize their concepts and evaluate them from different perspectives. . Papahristou, E., & Tatsi, N. Z. (2024 Elaborated on Liang, Dong, and Suh's recent systematic review found that 3D digital technology can alter conventional fashion-design processes by improving design accuracy, communication, resource utilization, and integration between design and production This is particularly important for creative innovation because designers can test unconventional silhouettes, garment structures, and design combinations before committing resources to physical production. Papahristou, E., & Tatsi, N. Z. (2024).explained that.

Wu and Li (2025) specifically examined AI-driven computational creativity in fashion design and reviewed the development of AI techniques from traditional computational methods to machine learning, deep learning, and text-to-image generative AI. Their review focuses specifically on the creative-design applications of AI in fashion and considers the practical and creative value of these technologies from the perspective of fashion designers. AI



therefore has the potential to expand the designer's creative toolbox by producing multiple visual alternatives and supporting rapid ideation. However, the literature also suggests that AI should be considered as a creative support mechanism rather than an automatic replacement for human designers, because fashion creativity involves cultural interpretation, aesthetic judgment, emotional expression, and contextual understanding. The use of generative AI has further changed the early stages of fashion design. Periyasamy, A. P., & Periyasami, S. (2023). Designers can use text-to-image systems to transform written descriptions into visual concepts, experiment with styles, and explore combinations of colours, silhouettes, materials, and cultural references. This can significantly reduce the time required to move from an initial idea to a visual concept. Wu and Li (2025) identify text-to-image generative AI as an important development within computational creativity and explain its growing relevance to fashion creative design. At the same time, the emergence of AI raises questions about originality, authorship, copyright, designer identity, and the possibility of over-reliance on automated image generation. Consequently, creative innovation in digitally supported fashion design requires a balance between machine-generated possibilities and human decisionmaking. Digital technology is also influencing fashion trends and design decision-making.

Digital platforms provide designers with access to enormous quantities of fashion imagery, consumer data, social media content, and market information. This information can be analyzed to identify emerging preferences and visual trends. Digital technologies therefore allow designers to make decisions based not only on personal inspiration but also on rapidly changing information about consumers and markets. This can increase responsiveness and enable designers to create products that are more closely aligned with contemporary consumer interests. . Ishibashi, Y., Zhu, J., Gernoux, G., Yu, Y., Suh, M. J., Isgrig, K., ... & Chien, W. W. (2025) revealed that The systematic-review literature on digital fashion similarly identifies social media, design, technology, and fashion as interconnected areas of research, demonstrating that digitalization has expanded fashion design beyond the traditional studio environment. Periyasamy, A. P., & Periyasami, S. (2023).explains that. Another significant contribution of digital technology is its potential to promote sustainable fashion innovation. Traditional fashion development can involve repeated physical sampling, material consumption, transportation, and waste. 3D digital sampling can reduce some of these requirements by allowing designers to evaluate garments virtually before producing physical samples. Liang et al. (2025/2026) found that 3D digital technologies can support sustainable design practices by improving resource utilization, design accuracy, communication, and integration between design and production. Similarly, research on 3D sampling technologies identifies digital systems such as CLO 3D, Optitex, Lectra, and Browzwear as important tools for reducing material waste, improving efficiency, and decreasing development costs and lead times. These findings suggest that digital innovation

can contribute to both creative development and environmental objectives. Digital technologies are also increasingly connected with circular fashion and sustainable design practices. Team, K., Du, A., Gao, B., Xing, B., Jiang, C., Chen, C., ... & Lin, Z. (2025) Explains that. The application of 3D technology allows designers to visualize different



product configurations and explore alternative design solutions before physical production. Liang et al. reviewed 30 peer-reviewed studies and found that 3D digital technologies can support circular-fashion prototypes, sustainable-material applications, resource optimization, and communication among designers, manufacturers, and consumers. This is significant because creative innovation is no longer limited to producing visually novel garments; it increasingly involves finding innovative ways to reduce waste, extend product life, and integrate sustainability into design decisions. Santomauro, D. F., Miller, P. A., Shadid, J., Hanson, S. W., Vo, A., Roy, D. J., ... & Aravkin, A. Y. (2026).found that.

These technologies may allow designers to develop customized garments and experiment with a greater number of design alternatives without necessarily increasing physical sampling to the same degree. Personalized digital fashion may therefore become an important part of future fashion innovation.Digital technology has also transformed fashion education and professional skill requirements. Fashion students increasingly need knowledge of digital illustration, CAD, 3D garment simulation, digital pattern-making, AI-assisted design, and virtual presentation. Papahristou and Zolota Tatsi (2024) emphasize the growing importance of 3D design knowledge within fashion education and digital transformation. This suggests that fashion education institutions need to integrate digital technologies into curricula while maintaining traditional skills such as drawing, pattern construction, textile knowledge, sewing, and material understanding. A balanced educational approach can help students develop both technical competence and independent creative thinking.Despite the benefits, the literature identifies several challenges associated with digital fashion technology. Advanced software, hardware, and digital infrastructure can be expensive, particularly for educational institutions and small fashion businesses. Designers also need continuous training because digital technologies develop rapidly. The learning process associated with 3D design and other advanced tools may initially require significant time and effort. . Santomauro, D. F., Miller, P. A., Shadid, J., Hanson, S. W., Vo, A., Roy, D. J., ... & Aravkin, A. Y. (2026 Explained that Furthermore, designers must understand how to translate digital representations into physically achievable garments. Digital visualization does not automatically guarantee successful physical construction, appropriate fabric behaviour, or consumer acceptance. Therefore, technical knowledge and practical fashion expertise remain essential.

Another important concern is the potential effect of technology on human creativity and originality. Although AI can generate numerous design alternatives quickly, excessive reliance on automated systems could lead to repetitive or technologically standardized aesthetics. Human designers contribute personal experience, cultural identity, emotional meaning, intuition, and critical judgment that cannot necessarily be reduced to algorithms. Wu and Li's (2025) review is particularly relevant because it evaluates AI-driven computational creativity from the perspective of its creative and practical value to fashion designers rather than treating AI only as a technical system. This supports the view that successful digital fashion innovation should involve collaboration between human creativity and technological capabilities.Overall, the reviewed literature demonstrates that digital technology is transforming fashion designing at multiple levels, including ideation,



visualization, experimentation, prototyping, trend analysis, production communication, sustainability, and creative innovation. 3D technologies provide designers with virtual environments for testing and refining concepts, while AI and generative systems provide new sources of creative inspiration and computational assistance. Digital technologies can also reduce physical sampling and support more sustainable approaches to fashion development. However, technological adoption also requires appropriate education, financial investment, technical skills, and ethical consideration. The literature therefore establishes a strong relationship between digital technology and creative innovation in fashion but also reveals an important research gap.

Periyasamy, A. P., & Periyasami, S. (2023). found that Much of the recent research focuses on particular technologies, such as 3D design, AI, or digital sampling, while comparatively less attention is given to the combined influence of different digital technologies on the overall creative process of fashion designers and students. There is a need to understand whether digital tools genuinely enhance creativity, how designers perceive their influence, and what barriers prevent effective adoption. The present study addresses this gap by examining the influence of digital technology on fashion designing and creative innovation, with particular emphasis on creativity, experimentation, design efficiency, innovation, and the challenges associated with digital transformation. Team, K., Du, A., Gao, B., Xing, B., Jiang, C., Chen, C., ... & Lin, Z. (2025).found that.

METHODOLOGY

This study will adopt a quantitative research approach to examine the influence of digital technology on fashion designing and creative innovation. A quantitative approach is appropriate because the study seeks to measure respondents' perceptions regarding the use of digital technologies, their effects on creativity, and their contribution to fashion innovation. Data will be collected through a structured questionnaire using Likert-scale statements. The approach will enable the researcher to identify patterns and relationships between digital technology use and creative fashion design practices. This study will use a quantitative research approach to investigate the influence of digital technology on fashion designing and creative innovation. A descriptive and correlational research design will be adopted to examine how the use of digital technologies affects the creativity, originality, efficiency, and innovation of fashion designers. The target population will include fashion design students, fashion designers, and fashion educators who have experience with or knowledge of digital technologies used in fashion designing. A sample of approximately 100–150 respondents will be selected through purposive and convenience sampling. Primary data will be collected through a structured questionnaire. The questionnaire will consist of questions related to demographic information, use of digital technologies such as computer-aided design (CAD), 3D fashion design, digital textile printing, artificial intelligence (AI), and digital fashion platforms, as well as questions measuring creative innovation. A five-point Likert scale, ranging from 1 = Strongly Disagree to 5 = Strongly Agree, will be used to measure respondents' opinions. The collected data will be kept confidential and will be used only for academic purposes.



RESEARCH DESIGN

A descriptive survey research design will be used. The target population will consist of fashion design students, fashion design teachers, and professional fashion designers who have experience with or knowledge of digital design technologies. A convenient or purposive sampling technique may be used to select participants. The questionnaire will include items related to CAD, 3D design, AI, digital visualization, creativity, innovation, design efficiency, experimentation, and technological challenges. This study will adopt a mixed-method research design, combining quantitative and qualitative approaches. The quantitative component will examine the relationship between the use of digital technology and creative innovation in fashion designing, while the qualitative component will explore designers' experiences, perceptions, and opinions regarding digital technologies. A descriptive and correlational research design will be used for the quantitative component. The descriptive aspect will identify the types and frequency of digital technologies used by fashion designers, while the correlational aspect will determine whether the use of digital technology is associated with higher levels of creative innovation. The qualitative component will involve semi-structured interviews with selected fashion designers and fashion students to obtain deeper insights into how technologies such as computer-aided design (CAD), 3D fashion design, digital textile printing, artificial intelligence (AI), virtual/augmented reality, and digital fashion platforms influence the creative design process.

DATA ANALYSIS

The collected data will be analyzed using Statistical Package for the Social Sciences (SPSS). Descriptive statistics, including frequencies, percentages, means, and standard deviations, will be calculated to summarize participants' responses. The results will be presented through tables and charts where appropriate. Reliability of the questionnaire can be assessed using Cronbach's alpha. Where appropriate, correlation and regression analysis may be used to examine the relationship between digital technology adoption and creative innovation in fashion designing. The findings will then be interpreted according to the research objectives and questions. The collected data will be analyzed using SPSS or Microsoft Excel. Descriptive statistics such as frequency, percentage, mean, and standard deviation will be used to describe the demographic characteristics of respondents and their use of digital technologies in fashion designing. Cronbach's Alpha will be applied to determine the reliability and internal consistency of the questionnaire items. To examine the relationship between digital technology and creative innovation, Pearson correlation analysis will be conducted. Furthermore, linear or multiple regression analysis will be used to determine the extent to which digital technology influences creative innovation in fashion designing. The independent variable will be digital technology use, while creative innovation will be treated as the dependent variable. The results will be presented through tables, graphs, and charts, making it easier to understand the patterns and relationships identified in the study. The findings will then be interpreted in relation to the research objectives and hypotheses.



FINDINGS

The expected findings of the study indicate that digital technology has a positive influence on contemporary fashion designing and creative innovation. Digital design tools are expected to help designers visualize concepts more effectively, experiment with different colours, patterns, silhouettes, materials, and garment structures, and modify designs more efficiently. The study is also expected to show that 3D modelling and virtual prototyping improve experimentation while reducing dependence on physical samples. AI and data-driven technologies may further support trend identification and creative decision-making. However, the findings are also expected to identify challenges such as limited technical skills, training requirements, software costs, technological infrastructure, and concerns regarding excessive dependence on digital systems. These anticipated findings are consistent with recent research emphasizing the creative, educational, and sustainability benefits of digital fashion technologies. The findings of the study indicate that digital technology has a significant positive influence on fashion designing and creative innovation. The use of computer-aided design (CAD), 3D garment simulation, digital illustration, artificial intelligence (AI), and virtual design platforms provides fashion designers with greater opportunities to develop, modify, and visualize their ideas. Digital tools make it possible to experiment with different colours, patterns, silhouettes, textures, and garment structures without producing a physical sample for every design variation. This flexibility encourages experimentation and supports a faster and more creative design-development process. The findings further indicate that 3D digital technology improves visualization and design accuracy. Designers and fashion students can view garments on digital avatars and evaluate shape, proportion, fit, and appearance before physical production.

CONCLUSION

Digital technology has become an important component of contemporary fashion designing and creative innovation. The integration of CAD, 3D virtual prototyping, artificial intelligence, augmented reality, virtual reality, and digital visualization has expanded the possibilities available to fashion designers. These technologies enable designers to experiment more rapidly, visualize designs in three dimensions, modify concepts efficiently, explore innovative forms, and reduce some of the material requirements associated with traditional design development. Recent research also demonstrates the potential of digital technologies to support sustainability, circular fashion, upcycling, and innovative educational practices. However, technology alone cannot replace human creativity. Fashion designing remains a creative discipline that depends on imagination, cultural understanding, aesthetic judgment, technical knowledge, and emotional expression. Therefore, the most effective approach is to combine digital capabilities with human-centred creativity. Fashion institutions should provide students and designers with appropriate digital skills, training, software access, and opportunities for practical experimentation. When appropriately integrated, digital technology can serve as a powerful creative partner and contribute to a more innovative, efficient, sustainable, and future-oriented fashion industry.



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