Investigating the Relationship Between Technology and Artistry in Sustainable Design, Eco-Conscious Fashion

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Abstract

As the fashion industry continues to develop, virtual fashion design is turning into a more and more important tool for industry professionals. This study looks at how technology and creativity interact in the world of fashion design, paying particular attention to how virtual fashion affects sustainability and the creative process. The study starts off by giving a succinct history and development of fashion design, emphasising the significant influence of technology on the sector. The study then looks at the creative process of virtual fashion creation, highlighting the extraordinary chances it gives designers to play around with cutting-edge materials, colours, textures, and fashion trends. The study also explores how the creativity of fashion design has been impacted by virtual fashion. It contends that by providing fresh opportunities for invention and creativity, virtual fashion design has the power to completely alter the industry. The study emphasises the significance of enhancing traditional creativity in fashion design rather than displacing it with technology.

Keywords: Fashion Education, Virtual Fashion, Sustainability, Ethical Fashion Practices, Inclusivity, Social Responsibility

1. Introduction: Literature Review

The fashion industry benefits from faster invention, production, distribution, and consumption thanks to digitalization. (Janssens and Lavanga, 2020). The Metaverse is creating a new world where we may live, work, play, and shop using immersive virtual reality. The potential that the constantly evolving digital world provides luxury businesses, merchants, and even customers themselves is revolutionary, even though no one can fully predict how it will develop. The distinction between the real and virtual worlds will become less clear as more well-known luxury brands, like Gucci, Burberry, and Balenciaga, incorporate the Metaverse into their marketing strategies. The distinction between the physical and digital worlds will be blurrier than ever, and we will spend more time online than outside. (Soronen and Mantymaki, 2018). Self-expression channels can be improved via virtual fashion. Customers can create and submit a 3D avatar of themselves to a VR VRD that assesses personal characteristics (Nayak et al., 2019). We can preserve works of art and fashion thanks to digital channels. Due to their brittleness and connotations with low culture, 19th and 20th-century fashion accessories and antiques have traditionally been overlooked for preservation in museums and archives. Because of their growing understanding of the significant social, cultural, economic, and historical value of tangible fashion relics, companies, museums, and fashion designers are increasingly arranging, producing, and managing fashion archives. These and other fashion-related items. (Peirson-Smith and Peirson-Smith, 2020). Additionally, virtual fashion can be utilised to produce virtual fashion shows that can be accessible to a worldwide audience without requiring travel as an alternative to real runway displays (Porterfield and Lamar, 2021). There are various ways that virtual fashion could be more environmentally friendly than traditional fashion. The fact that virtual fashion eliminates the need for physical production, which may be quite resource-and environment-intensive, is one of its main benefits. Designers can lessen their carbon footprint and waste by producing digital clothing that can be worn in virtual surroundings (Baytar and Ashdown, 2015). It's crucial to remember, though, that virtual fashion is not a solution to the ecological issues the fashion industry is now facing. Environmental effects may still be felt through the materials used to make digital clothing and the energy needed to power virtual locations. There are also many worries about the risks to privacy when utilizing AR mobile apps (Chan et al). Additionally, not all consumers may be able to access virtual fashion, particularly those who lack access to the equipment needed to partake in such experiences. Overall, even if virtual fashion has the potential to be more environmentally friendly than physical fashion, it is crucial to keep researching and improving environmentally friendly practices in both types of fashion.

Although there are many advantages to virtual fashion, there are also difficulties and technical restrictions. Since the aim of design is to simplify a complex concept or product, it necessitates a methodical approach (Chan et al). However, contemporary software, especially 3D modelling programmes, was developed from an engineering standpoint and uses language that most fashion designers are unfamiliar with (Kim, 2022). The objective of digitization in the fashion industry is to promote sustainability while streamlining the design, production, and business of tangible goods using a variety of digital tools (Chan et al). Furthermore, as the technology is still in its infancy and cannot yet accurately mimic the texture and feel of real fabrics, there are restrictions on the kind of materials that may be employed in a virtual context.

In summary, physical and virtual fashion are two separate yet related facets of the fashion industry. Virtual fashion has become a new trend in recent years, replacing the traditional

physical fashion that has dominated the market for millennia. It offers advantages and disadvantages to producers, buyers, and designers alike. It will be crucial as virtual fashion develops to consider its effects on the fashion business and society at large and to make sure that it supports ethical and sustainable fashion practices. Therefore, three experiments are used in this study to examine the junction of virtual and physical fashion in various ways. In the first experiment, which combines virtual and physical fashion, participants discuss imaginary GUCCI trainers, make them, and then compare how they transition from the virtual to the real world. The second experiment, which combines actual and virtual fashion, can entail adding genuine clothing to a virtual setting or producing digital representations of real clothing. In the third experiment, participants create their own virtual twins and experiment with virtual dressing to create a virtual version of themselves.

2. Background and Related Work

The idea of virtual fashion as a brand-new, cutting-edge means of making and consuming fashion has drawn more attention in recent years. Virtual fashion may have a significant impact on how the fashion industry grows in the future, despite the fact that it is difficult to make firm predictions about the future of any business (Young and Mattila, 2014). The fashion business is currently witnessing the rise of a new set of technology. Body scanners, vector-based, and 3D pattern-cutting technologies are enabling a new sort of reasonably priced customization that allows garments to be made to the customer's exact specifications. Thanks to developments in artificial intelligence, brands can now analyse consumer trends and produce data-driven designs in a more sophisticated manner. Automated sewing machines (sewing robots) may begin to replace sewing machines and machinists in some large industrial settings that produce standardised clothes (Bowstead, 2022). The first is how the advancement of virtual technology has affected traditional fashion. Precise forecasts based on colour, pattern, and style are required for the challenging process of trend forecasting. At the moment, predictive models and machine learning are being used by academics to foresee trends. Fashion shows are important events that are valued by high street and fast fashion shops. These occurrences inspire them to design fresh, broadly attractive looks. The results show trends that retailers may use for the mass market consumers of the upcoming season (Chakraborty et al., 2020).

Snapchat, a multimedia messaging software, uses its Augmented Reality (AR) filter to take billions of selfies (or "snapshots") every day. Your digital twin may already "wear" 3D and incredibly realistic clothing thanks to the fashion industry's specific enthusiasm for AR technology (Chan et al., 2021). This exploratory study investigated three-dimensional (3D) virtual design and fitting technology (virtual bodies) using 3D body scan avatars. This technology could allow customers to collaborate with designers throughout the design phase, which could have a long-term impact on the price and usefulness of clothing. For a semi-special event, each of the eight apparel design students designed an item of clothing. The participants were scanned using a Human Solutions Vitus XXL 3D body scanner to create their own virtual bodies. These digital personal fit models that were built into the Optitex system were used in the computer-aided design of the clothing. Participants also saw a brief movie that addressed the environmental effects of existing practises for garment design, production, use, and disposal (Baytar and Ashdown, 2015).

The growing awareness of sustainability issues within the fashion industry, in addition to the advancement of technology, is one of the major trends igniting interest in virtual fashion. As was already said, virtual fashion offers new options for experimentation and innovation while

also having the potential to be more sustainable than physical fashion in many ways, including by reducing waste and resource use. Virtual fashion may become a more alluring alternative to conventional fashion methods as consumers and industry professionals place a greater emphasis on sustainability. The usage of digital clothing models decreases inventories and overproduction, which has an impact on environmental and cultural sustainability. It decreases or eliminates inventories, excess output, pre-consumer waste, and excessive raw material use from an environmental standpoint. The cost of unsold clothing is eliminated, prices are set more transparently, and enough money is paid for the work of designers, manufacturers, and suppliers of high-quality materials to provide a positive relationship between productivity and employment, all of which have an impact on clothing pricing. encourages diversity and individuality through improved clothing personalization. Additionally, the elimination of long-distance materials and labour supply yields favourable effects in terms of environmental sustainability when controlled, long-lasting, environmentally friendly materials and labour quality management are used in local garment manufacture. Finally, it has a positive impact on social and cultural sustainability by treating employees fairly and ethically and by repurposing local industrial operations in cultural contexts. Traditional manufacturing methods and technologies are viewed from a new contemporary/digital perspective, and the synergistic integration of traditions has the potential to increase their innovative effects (Casciani et al., 2022).

The growth of digital technology and social media is another trend igniting interest in virtual fashion. The way individuals interact with fashion and fashion firms has evolved significantly as a result of the internet and social media platforms. The entry threshold for this ideal lifestyle has been lowered by the internet, making fame and superstardom more approachable. By encouraging customers to make online purchases, Instagram influencers have altered how clothing is offered on actual shopping streets. Fast fashion is a term used to describe a recent trend for "cheap clothing lines that copy current high-end fashion. These outfits "help young people express their underlying desires." Young consumers follow reality TV stars on social media, which influences their purchasing behaviour. The cult of fame and its application in social media have had a significant impact on the development of online retail. Because of this, the British high street was ultimately destroyed. This does not portend the end of the high street or even of fashion (Marroncelli and Braithwaite, 2022).

Examples of fashion companies and designers who have already begun experimenting with virtual fashion are also available. The virtual fashion game "Afterworld: The Age of Tomorrow" was developed by the fashion label Balenciaga in 2020. It allows players to explore a virtual world and interact with digital representations of Balenciaga's clothing. Similar to this, designer Carlings has produced a line of "digital clothing" that is totally made up of apparel that can be seen being worn in pictures or movies (Tepe and Koohnavard, 2022).
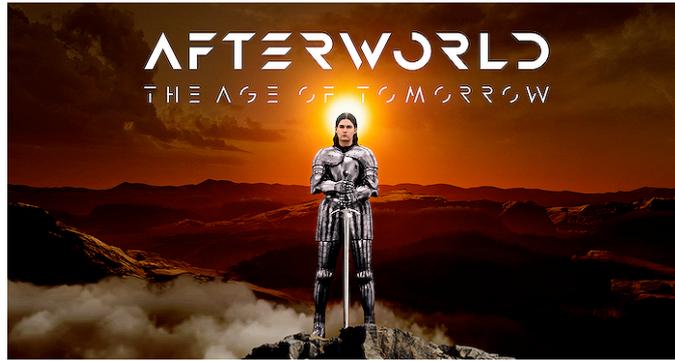
Fig. 1: Balenciaga Afterworld Game

Even while virtual fashion is still a young and experimental subject, there are already many indications that it could fundamentally alter the fashion business. Virtual fashion appears set to play an increasingly significant part in the future of fashion as digital technology continues to develop and sustainability and digital experiences become a focus for consumers and industry players alike.

3. Methodology and Implementation

Although the three experiments presented in this paper provide some light on the relationship between virtual and real fashion, it is crucial to keep in mind that their scope is constrained and they cannot provide a conclusive response to the question of whether virtual fashion will dominate the fashion industry in the future. The experiments carried out here offer some fascinating findings and observations, and the design study methodology utilised in this paper is a helpful way to investigate new and emerging ideas and concepts. The findings of design study, however, cannot be applied to the entire fashion sector as they are often more exploratory than empirical.

To examine how they translate in the real world, Gucci shoes are first constructed virtually in the first experiment that merges virtual and real fashion. In order to merge real and virtual fashion, the second endeavour involved making virtual apparel. In the third experiment, participants build their own virtual twins and experiment with virtual attire, making a virtual replica of themselves, etc. Individuals can generally benefit from using this design study approach, which includes three experiments, to better understand the potential benefits and drawbacks of virtual fashion as well as how it interacts with physical fashion.

Experiment 1

Gucci is one of the leading fashion brands looking into the potential of virtual fashion. Gucci collaborated with online clothes shop Wanna to create the Gucci Virtual 25 (Fig. 2), a virtual trainer that was initially unveiled by the company in 2019. An innovative and standout product, the Gucci Virtual 25 ushers in a new era for the garment industry (Loranger and Roeraas, 2023). The virtual trainer can be worn in digital settings like virtual reality and augmented reality since it is not limited by the laws of the physical world. This opens up new possibilities for the fashion industry in terms of innovation, sustainability, and accessibility. Along with the technical challenges for creating the Gucci Virtual 25, it's crucial to consider the wider implications of virtual fashion. Virtual fashion has the potential to bring about various changes in the fashion industry. When clothing is created and delivered physically, less waste and carbon emissions are generated, and accessibility for customers who might not

otherwise have access to physical stores or commodities is increased. The Gucci Virtual 25 represents a significant step for the fashion industry overall thanks to Gucci. Although there are now challenges and limitations with virtual fashion, the potential benefits make it an exciting area for research and development.

[a]   [b]   [c]

Fig. 2: Gucci Virtual 25 shoes

Therefore I made a tangible version of Gucci Virtual 25 and made a suggestion about how virtual and physical fashion relate to one another. One way to look at it is as a technique to close the gap between the virtual and real worlds, making virtual fashion more real and available to a larger audience. On the other side, it may be claimed that making a physical version of a virtual product compromises the fundamental nature and intent of virtual fashion, which exists and can only be experienced in a digital setting.

[a]   [b]   [c]

[d]   [e]   [f]
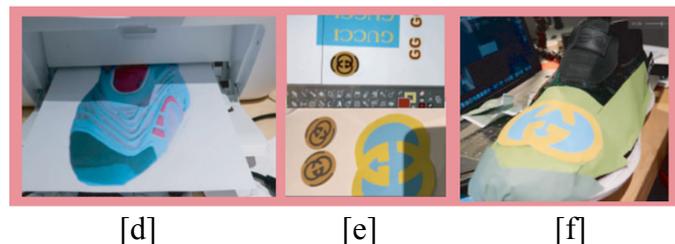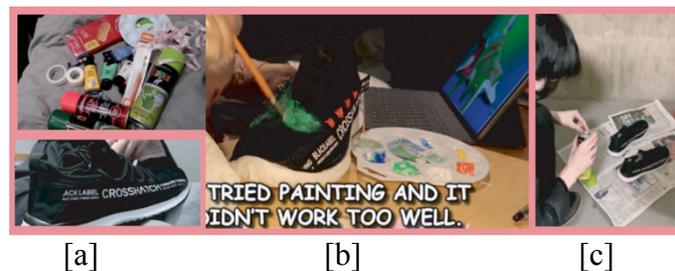
Fig. 3: Gucci Virtual 25 Physical Shoes Making Process

Practically speaking, producing a physical replica of the Gucci Virtual 25 might demand a tremendous amount of resources and investment in terms of both materials and manufacturing techniques. This would necessitate giving serious thought to both the creation of the product's environmental effects as well as any prospective demand for it. Making a tangible version of the Gucci Virtual 25 may, however, be an interesting and thought-provoking investigation of the link between virtual and physical fashion from a conceptual and creative standpoint. It might put to the test accepted notions of what fashion is, how it's made, and who wears it, creating new opportunities for innovation and creativity. I hope that this time process is interpreted as a means of pushing the limits of fashion, investigating the potential for the fusion of the virtual and real worlds, and possibly even as a challenge to the very essence of virtual fashion.
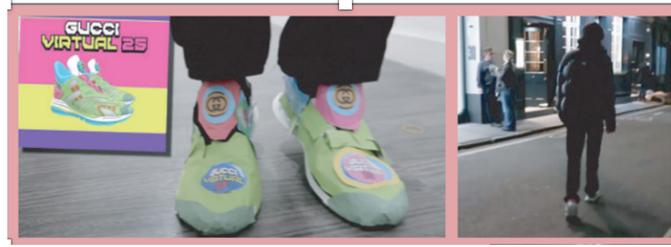
[a]　　　　　　　　　　　[b]

Fig. 4: Wearing Gucci Virtual 25 physical shoes in public

[c]　　　　　　　　　　　[d]

Fig. 5: Put Gucci Virtual 25 Physical Shoes in Selfridge Gucci Shop

My companion and I fashioned it out of various materials, wore it in public, and it became a meaningful method to question accepted notions of what fashion is and how it ought to be created and used. It can start debates and spread awareness about the potential of virtual fashion as a fresh form of artistic expression by bringing virtual goods into the real world. This demonstration demonstrates that while fashion has always been a way to express oneself and push limits, some people may be sceptical of or perplexed by virtual things. Finally, exhibiting a tangible replica of Gucci Virtual 25 at Gucci stores might be an impactful method to highlight the possibilities of virtual fashion and investigate fresh ways to engage customers. The established methods of producing and marketing clothing would need to change, which would take some time and effort to accomplish.

In conclusion, making a physical replica of Gucci's Virtual 25 and wearing it in public while also showcasing it in Gucci stores might be a valuable method to investigate the convergence of virtual and physical fashion and push the envelope of what fashion can be and what the future may hold.

Experiment 2

First, I used digital tools and techniques like CAD, AI, and PS to create the virtual s fashion. to eliminate the chance that standard powerless materials won't work with virtual fashion. I utilise the most straightforward ideas to make tangible products that closely mirror their digital equivalents in order to get over these difficulties.
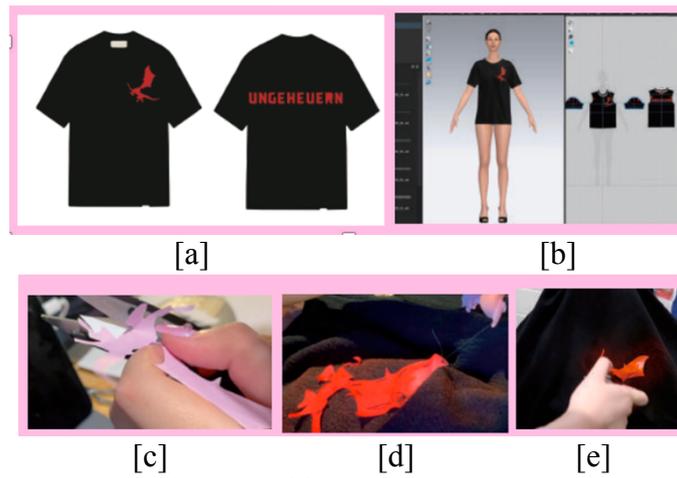
Fig. 6: Making Virtual Clothes

To find areas of overlap and potential synergies between the two disciplines, it may also be beneficial to collaborate with specialists in both physical and virtual fashion. I utilised the workshops run by my Goldsmith tutors and asked for assistance.

Overall, there are many chances for creativity and collaboration between the virtual and physical fashion worlds, even though it might be difficult to make real products look like their virtual equivalents. By investigating these options, we can develop new types of clothes that are both aesthetically pleasing and environmentally friendly.

Experiment 3

Creating a virtual doppelganger can be an insightful and creative way to investigate the nexus between virtual and real fashion. People can experiment with various looks and trends without using actual clothing or accessories by creating a digital version of themselves. Virtual fitting rooms and fashion shows can be made using virtual twins to offer individualised virtual fashion experiences. By eliminating the need for the actual production and delivery of clothing, this can lessen the environmental effect of the fashion industry. Virtual twins can also be utilised to examine contemporary concerns with identity and self-expression in the digital age. Virtual twins can offer a new method to explore and express our sense of self in a quickly changing environment as technology becomes more and more ingrained in our daily lives. Making a virtual twin may seem like a simple task, but it offers a valuable chance to investigate the potential of virtual fashion and its effects on our lives and the environment. Due to the fusion of technology into everyday life, a person today has two simultaneous existences: a real existence and a virtual existence. The person can now explore a new kind of being called the digital self, which is progressively more natural and intertwined with sociocultural conduct. This virtualization of the individual has an effect on the cultural and economic fabric of the world and alters lifestyle. (There is some sociology in this section.) This essay is a portion of a PhD thesis that uses fashion design goods as an example to investigate how digital tools and virtual environments affect human creativity and conceptual development. Research, idea generation, and project communication have all been considerably changed by virtual environments (Soronen and Mantymaki, 2018).
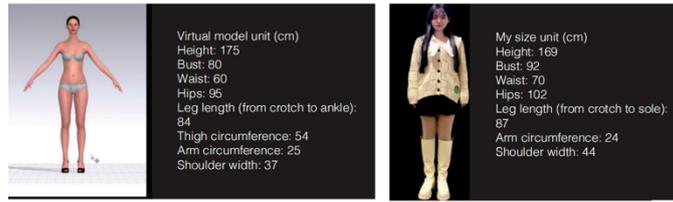
[a]　　　　　　　　　　　　[b]

Fig. 7: Making Virtual twin for me
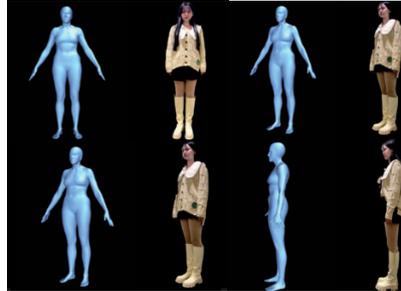
Fig. 8: My virtual twin

Virtual twin production has significant effects on sociology and self-expression. Virtual twins are a novel method of constructing identities in the digital age, according to sociology. People are increasingly constructing digital representations of themselves that mirror their online personalities as social media and virtual communities grow in popularity. This is expanded upon by virtual twins, which enable anyone to design a fully-fledged digital representation of oneself for a range of uses, including fashion and self-expression.

Virtual twins provide a novel means of exploring and experimenting with one's sense of self in terms of self-expression. Individuals can experiment with various styles, looks, and identities by creating a digital version of themselves without being constrained by physical clothing or social expectations. This is especially powerful for people who might be hesitant to express themselves physically through clothing or for people who live in places where their options for clothing could be constrained (Soronen and Mantymaki, 2018).

The fashion business, which is increasingly using virtual models and digital fashion shows, can be significantly impacted by virtual twins. Virtual twins can give people a means to interact with this new fashion trend as virtual fashion grows more popular and examine how it might interact with real-world fashion (Salman et al., 2016).

Fig. 9: Brand Hanifa Virtual fashion show

In general, the creation of virtual twins has significant ramifications for sociology, self-expression, and the fashion sector. Virtual twins are influencing how we engage with and comprehend the digital environment around us by providing a fresh way to investigate identity and fashion. Overall, the idea of producing a real-world Gucci Virtual 25 is

intriguing since it blurs the lines between the actual and virtual worlds. It entails providing a digital object a tangible presence by converting it into a physical form. The designers are essentially questioning conventional ideas of fashion and materialism by wearing a tangible version of this virtual thing to a Gucci store. It's a unique and imaginative scene.

The project of building a real-world Gucci Virtual 25 handbag, designing a virtual t-shirt and building a virtual twin is an interesting investigation of the boundary between the real and virtual worlds. It forces us to consider how technology influences who we are and how we express ourselves. Additionally, it shows how powerful creativity and invention can be in shattering preconceived notions of what is possible.

Conclusion

In other words, the experiment of building a real-world Gucci Virtual 25 and producing a virtual t-shirt and virtual doppelganger shows how virtual fashion has the potential to revolutionise the fashion business. It pushes back against conventional ideas of materialism and self-expression and invites us to investigate the lines separating the real world from the virtual one.

The rise of virtual fashion presents new chances for designers and innovators to experiment with avant-garde and environmentally friendly fashion methods. Virtual fashion enables designers to create without being constrained by limitations on materials and production, which can decrease waste and improve sustainability. Virtual fashion can also give customers a more tailored and engaging fashion experience, increasing their engagement with the market.

The construction of more sophisticated technology and software to simplify the creation of virtual apparel and accessories may be the focus of future work in virtual fashion. This might include tools for 3D modeling, virtual reality, and artificial intelligence. The social and cultural effects of virtual fashion and how it influences conventional fashion practises could also be studied through research.

Virtual fashion will probably become a research topic as it keeps gaining popularity and reputation in the fashion business. It will be fascinating to watch how the industry develops to incorporate virtual fashion into its practices as the worlds of technology and fashion meet. In the end, the future of virtual fashion is full with opportunities and has enormous potential to help the fashion industry become more inventive, sustainable, and diverse.

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