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THE VIRTUAL REALITY AS TEACHING TOOL IS BECOMING A NORM. THE VIRTUAL REALITY (VR) AS PART OF THE OUTFIT DESIGN PROCESS IN THE EDUCATION PROGRAM OF THE TEXTILES AND FASHION DESIGN STUDIO OF THE FACULTY OF INTERIOR DESIGN OF THE ACADEMY OF FINE ARTS IN KRAKÓW – A CASE STUDY

Case study

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Abstract

The article raises the increasingly popular topic of using the virtual reality as a teaching tool, especially in design. At a time when face-to-face contacts are hampered, the "real" reality is severely limited by a system of prohibitions and regulations, and the functioning of the digital reality (the VR or AR space) is necessarily becoming the new norm. The Fashion Start-up of the Textiles and Fashion Design Studio of the Faculty of Interior Design is introducing a new teaching tool: the VR Fashion Design Workflow 1.0. The Studio, as the first academic unit specializing in fashion design in Poland, and one of the first in Europe, is digitalizing the process of designing clothes in cooperation with Context Retail Design. The virtual fashion illustration, virtual showroom and Virtual Fashion Show are the effects of the implementation of the "digital sewing" program and of the virtual fashion presentation. In this article I will present the method and results of working in the virtual reality space of the Textiles and Fashion Design Studio from the practical side against other international art universities specializing in the fashion design.

Keywords

virtual reality, augmented reality, creativity, outfit design, process, teaching tool

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1. VR as part of the outfit design process – the case study

Fashion and the VR (Virtual Reality) seem to be made for each other. The virtual reality with a highly graphical user interface is the ideal environment for the process of designing clothes, prototyping and presenting collections.

The VR Fashion Design Workflow 1.0 as an outfit design process using virtual reality technology with specialized hardware and software, designed and prepared specifically for the Textiles and Fashion Design Studio (T&FDS) of the Faculty of Interior Design of the Academy of Fine Arts in Kraków is subjected to a detailed analysis in terms of the method and work results. The implementation of the teaching tool allowing for the use of virtual reality for the creation of outfit designs and the position of T&FDS as a pioneer in the introduction of this field of expertise to the teaching program among a number of prestigious international academic units specializing in outfit design is a key topic in this analysis.

The virtual reality is defined as a computer-generated simulation system that detects user behaviors, providing a sense of presence and embodiment in the virtual space based on multisensory feedback.[1] I will use this short definition at the outset for the introduction of the problem in question.

The virtual reality (VR), augmented reality (AR) and mixed reality (MR) have necessarily gained the momentum of development, absorbing ever larger areas of our lives. They have long since gone beyond the domain of computer games, to which they were initially dedicated. They have become inevitable. The pandemic caused by the CoViD-19 and its associated real limitations gave only an additional boost that released the safety pin. This fact has led to the invasion of the latest technologies on the present reality.

The basic concept of differences between virtual technologies is the level of immersion. The VR as the most immersive one, with a highly graphical interface and with the all-encompassing inner world gives you the opportunity to completely immerse yourself in the abyss of the virtual space.

In the age of acceleration of technology by the pandemic, the long expected entry of the VR/AR technology and robotics into the everyday life is becoming as real as possible. The post-humanism will combine culture with industry. Virtual worlds will become more expansive and sophisticated, driving culture and design, and enabling new ways of expression and experience.[2]

Metaverse as a collective virtual shared space, covering the sum of all virtual worlds, augmented reality and the Internet will become a fact. The term is usually used to describe the concept of a future

1 Understanding Virtual Reality—Interface, Application, and Design; William Sherman, Alan Craig; 2003
2 Future Innovations 2023, WGSN forecast team, online: https://www.wgsn.com/en/, accessed on 25.02.2021

iteration of the Internet, consisting of persistent, shared, three-dimensional virtual spaces connected to the perceived virtual universe.[3]

What are the benefits of using virtual reality tools in the outfit design process?

How do they affect creativity? Are we able to shorten the process by using the VR technology in design? Skip unnecessary intermediate steps and, thus, save time, material and human resources?

To answer these questions, we will follow step by step the design process using the VR technology as a form of a new working tool of the "lockdown generation".[4]

The basis of this study is the VR Fashion Design Workflow 1.0 workshops prepared and conducted by Context Retail Design with students of the Textiles and Fashion Design Studio (T&FDS) of the Faculty of Interior Design of the Academy of Fine Arts in Kraków.

Another point of the analysis is the presentation of selected international academic units specializing in fashion design and a brief description of examples of their projects. The paper ends with a conclusion on the use of the VR in the fashion industry, in the process of designing and presenting collections, shown on examples of specific global brands.

2. New technologies and their implementation

The VR Fashion Design Workflow 1.0 was created in 2020 on the initiative of the Fashion Start-up of the Faculty of Interior Design of the Academy of Fine Arts in Kraków for students of the FTextiles and Fashion Design Studio by Context Retail Design as part of the project titled "Designing the future – the program for development of the Jan Matejko Academy of Fine Arts in Kraków in the years 2018-2022", funded by the National R&D Center (NR&DC). It presents a method where the Tilt Brush VR and the Marvelous Designer applications work together, as well as the proprietary procedure for systemic inclusion of the VR and CAD 3D technologies into the design process, tested by Context Retail Design during their R&D work. It presents ways how to make, using a VR suite, a conceptual 3D model on a clothes dummy, transfer the VR model to the CAD system and to 3D model viewers; produce a digital outfit prototype in the CAD system, in the form of a 3D model, fitting the outfit to an avatar, simulating the physics of fabrics, virtual presentation; add and remove in the VR space multiple 3D models made in the CAD system, perform adjustments and make design versions, record work stages, record photo and video directly from the VR space.

3 FORBES, online: https://www.forbes.com/sites/cathyhackl/2020/07/05/the=-metaverse-is-comingits-a-very-big-deal/?sh-26d62e2c440f , accessed on 07.03.2021

4 The global crisis caused by the CoViD-19 pandemic will have a long-term impact on careers of young people under the age of 25, which prompted the International Labor Organization (ILO) to define this demographic as the "lockdown generation".

The Virtual Fashion Showroom application and the Virtual Fashion Show are the outcomes of the VR Fashion Design Workflow 1.0.

The design process of the VR Fashion Design Workflow 1.0 method starts from the Tilt Brush VR application and a fashion illustration placed in the virtual space.

The place of work is a designer's virtual workshop, the Fashion Design Workshop, a three-dimensional model of the scene designed and created specifically for the purpose of this program.

The designer's virtual workshop is used for conceptual design work, where three-dimensional sketches of silhouettes are created – fashion illustrations in the virtual reality in the scale of 1:1. Working at this scale is most similar to working in a real studio; allows you to see each element of the design in the real size. The Fashion Design Workshop is also a space for testing objects and prototypes created in CAD, for presentation of collections and the whole design process.

The scene model includes a cylindrical space sized 600 x 300 cm, walls and floors. The scene has a grid with a 10 cm line spacing, helpful for scaling and leveling objects. There are also four clothes dummies. The advantage of working in the designer's virtual workshop is the ability to work with any scale. The 1:1 scale is the default size that can be freely transformed in the design process, depending on the requirements for the view of the scene, object, or detail.

With an extensive palette of brushes and other drawing tools of the Tilt Brush VR, the creative space is practically limitless. The fashion illustration, which is created in three dimensions, opens the boundaries of thinking about the design, allows it to be viewed from any side: outside, inside, top or bottom. Re-scale the scene to compose in more detail and zoom out to evaluate the composition as a whole.

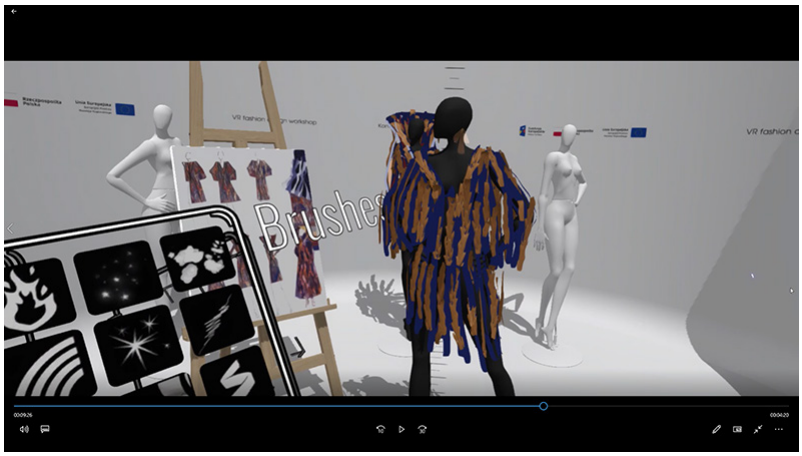

Figure 1: VR Fashion Design Workflow 1.0, designer's virtual workshop; source: the author's archive

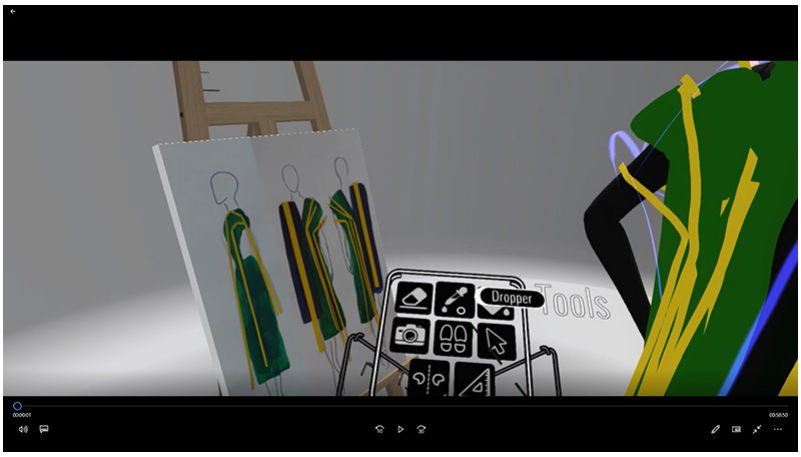

Figure 2: VR Fashion Design Workflow 1.0, designer's virtual workshop; source: the author's archive

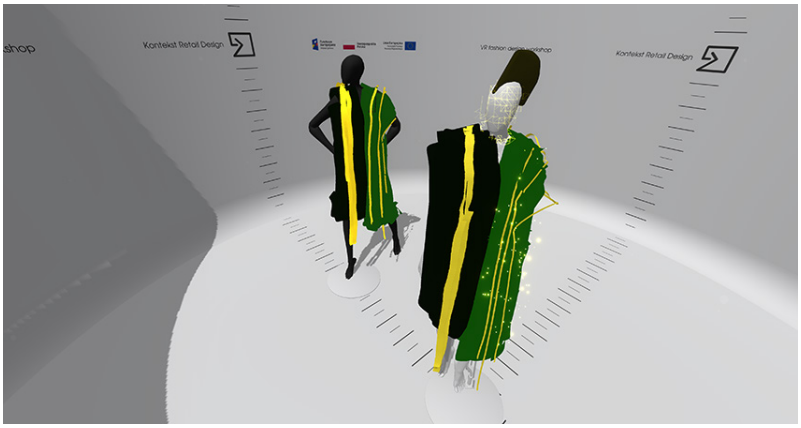

Figure 3: VR Fashion Design Workflow 1.0, designer's virtual workshop; source: the author's archive

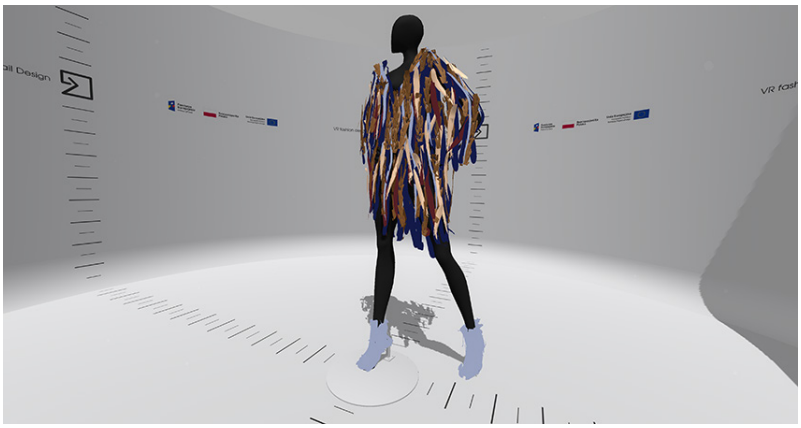

Figure 4: VR Fashion Design Workflow 1.0, designer's virtual workshop; source: the author's archive

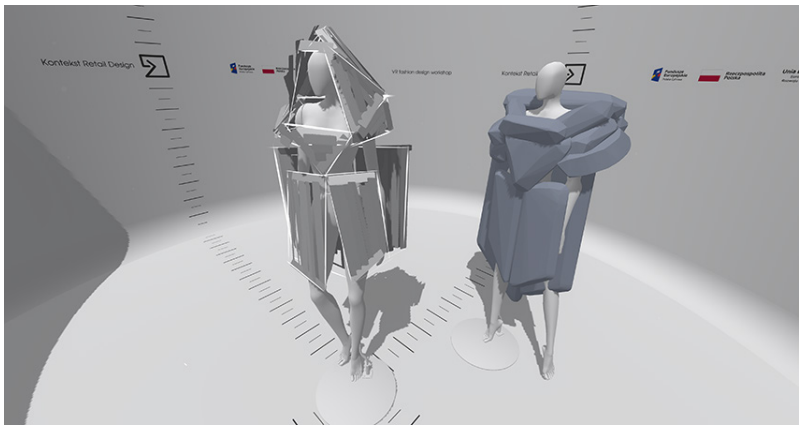

Figure 5: VR Fashion Design Workflow 1.0, designer's virtual workshop; source: the author's archive

Figure 6: VR Fashion Design Workflow 1.0, designer's virtual workshop; source: the author's archive

Features such as undo, copy, delete, erase, lines, grid – as those offered by many graphic applications – also apply generally here.

The model created in the Tilt Brush VR, the virtual fashion illustration, can not only be viewed in space with a VR headset but also exported to commercial software suites featuring 3D model viewers, such as POLY or SKETCHFAB. Making the model available in a 3D viewer is an important link in the design process because it allows you to preview a 360-degree sketch on a display outside the VR, facilitates remote correction and allows group work on the design.

Figures 7 and 8: VR Fashion Design Workflow 1.0, the Schetchfab platform; source: the author's archive

The next step of the VR Fashion Design Workflow 1.0 design process is the 3D modeling of clothes directly on the avatar. This process takes place outside the VR area.

The Marvelous Designer, a real-time CAD application, is dedicated to this method. The Marvelous Designer simultaneously combines 2D template designs with 3D modeling on the avatar and allows you to change the avatar' poses, see the model on the catwalk and simulate the physics of the fabrics.

The imported 3D fashion illustration, made earlier in the Tilt Brush VR application, in the first step of the design process is the sketch (the mapped model). After modeling the object in the 3D CAD system, the design is re-imported into the designer's virtual workshop.

The model developed in the Marvelous Designer application becomes a "virtually real" object, combining digital and real aesthetics, moved into the VR space of the Fashion Design Workshop, Virtual Fashion Showroom or Virtual Fashion Show. It is a digitized prototype, digitally stitched, with all details of fabrics, needlework and other details. It becomes a finished project realized in the virtual world.

The virtual reality technology as a tool suddenly removes a number of moves and steps which are unavoidable in the physical designing to get the final prototype. The VR makes the design process more flexible and spontaneous, and allows users to view their creations in different dimensions. The user can bypass the clothes dummy step, evaluate the shape, colors and textures.

The Virtual Fashion Showroom & Fashion Show application is a virtual presentation space: an exhibition of completed designs. Objects are displayed here on clothes dummies the layout of which is arranged in space on mobile platforms. The scene offers opportunities for various ways of presenting objects: from catwalk arrangements, through exhibition boxes or display cases, to a photographic multi-studio. The background of the Virtual Fashion Showroom space is transformed depending on

the ambience of the scene and the nature of the fashion collections. The user selects from a predefined palette types of animation or fixed image to fill the scenery of the virtual showroom. It is possible to add any moving image, such as a background projection or mapping, also onto the presented objects of the collection. You can be anywhere in the space, whether you're a viewer, watching the scene from a distance, or a participant staying in the center of the scene.

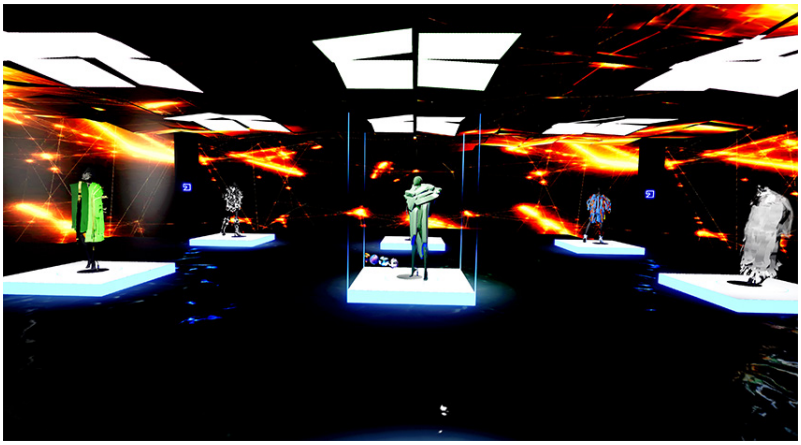

Figure 9: R Fashion Design Workflow 1.0, Virtual Fashion Showroom; source: the author's archive

Figure 10: R Fashion Design Workflow 1.0, Virtual Fashion Showroom; source: the author's archive

Figure 11: R Fashion Design Workflow 1.0, Virtual Fashion Showroom; source: the author's archive

There are few educational approaches that promote discovery and creativity using VR design environments. This type of tool is not yet widely available and widespread in outfit design curricula. T&FDS is the first Polish and one of the few academic units specializing in fashion design, which already applies and widely promotes the use of this tool in the design process.

The VR teaching tool in clothing design is used individually by some prestigious universities, including the London College of Fashion (LCF), the University of Illinois Urbana-Champaign and the Parsons School of Design in New York. However, it is not yet a widely used tool or a standard in curricula. In most cases, the method and program of specific application of VR environments are developed through R&D programs by special entities appointed by these universities. Among others, the London College of Fashion has introduced the VR technology into the curriculum through the Digital Anthropology Lab (https://digital-anthropology-lab.arts.ac.uk) and the Fashion Innovation Agency (https://www.fialondon.com/projects), the Parsons School of Design thanks to the XREALITY Center (https://xcenter.newschool.edu), the University of Illinois Urbana-Champaign via the IDEA Lab in Illinois (https://tec.illinois.edu/resources/grainger-idea-lab).

According to Sarah Byfield-Riches, the head of business development at the London College of Fashion, the VR technology is part of the curriculum and a fast-growing area.

Nowadays it is more timely than ever. The Digital Anthropology Lab, by introducing new technologies, such as the VR, facilitates collaboration between fashion, aesthetics, craftsmanship and society, into a range of tools to help prepare for the increasingly connected mixed reality (MR). The Fashion Innovation Agency at LCF is using new technologies to move fashion and design beyond physicality into a new era of digital experience. Several virtual reality projects of the Fashion Innovation Agency worth mentioning include: the Fashion Metaverse held during the London Fashion Week; the creation of the virtual showroom by designer J.W. Anderson using the augmented reality (AR); the Fabric of

Reality, an Immersive VR Fashion Show, a virtual show presenting the work of three designers from LCF showing the history and narration of their collections; and the AI Catwalk, a virtual fashion show where the catwalk was created from an archival footage from a LCF show (students experimented with artificial intelligence, 3D design and animation to generate new and inspiring ways to present the collection).[5]

Figure 12: The Fabric of Reality – an Immersive VR Fashion Show; source: https://www.fialondon.com/projects,

Figure 13: The Fabric of Reality – an Immersive VR Fashion Show; source: https://www.fialondon.com/projects,

5 Fashion Innovation Agency, online: https://www.fialondon.com/projects, accessed on 07.03.2021

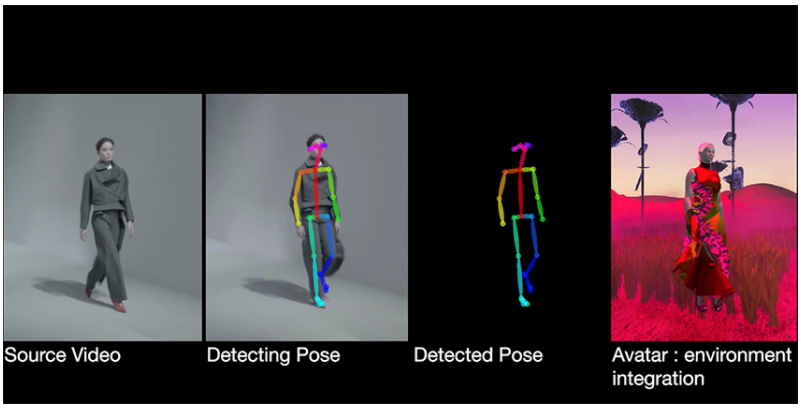

Figure 14: AI Catwalk; source: https://www.fialondon.com/projects,

The goal of the XREALITY Center, the research center of the Parsons School of Design in New York City, is to advance research and design innovations with new technologies in the area of virtual, augmented and mixed realities and artificial intelligence. The project for the modeling of a cloak designed in the 1920s by Paul Poiret in the virtual reality, in collaboration between the Parson School of Design and the XREALITY Center, being a part of the Parsons Fashion Study Collection, focused on creating an immersive experience that allowed students to come close, study the design from the inside, learn how it was made, and learn about its historical significance. The project is a demonstration of how VR technologies are changing the learning process.[6]

Figure 15: Parsons Fashion Study Collection – Paul Poiret's cloak in VR; source: https://xrcenter.newschool.edu/projects/parsons-fashion-study-collection-virtual-reality/

Students of the University of Illinois Urbana-Champaign Arts and Humanities, also use the virtual reality as a work tool. With the IDEA Lab, the R&D center of the University of Illinois Urbana-Champaign, a special VR program called Komodo has been developed that allows you to design your

6 The New School XREALITY Center, 10.09.2018, online: https://www.xrcenter.newschool.edu/projects/parsons-fashion-study-collection-virtual-reality/ , accessed on 07.03.2021

outfits in the VR space. Like the VR Fashion Design Workflow 1.0, this program uses the Tilt Brush VR software and allows users to import existing 3D contents and view them in the virtual reality.[7]

The VR technology and its use as a tool are becoming increasingly common not only in teaching but also in the work of designers of global brands, in fashion houses and in the presentation of commercial collections.

Does using the VR as a design tool in the fashion industry minimize inputs? Is the presentation of a collection in the virtual reality more spectacular than a real show?

In the days of the "lockdown generation" is a necessary alternative. The CoViD-19 has only accelerated and disseminated the need for the VR to function as a work and presentation space. When constraints and top-down precepts do not allow traditional presentations, virtual worlds are a lifesaver.

In addition, the VR technology brings other real benefits that are not insignificant in the face of progress that is constantly accelerating.

The most spectacular ones are the speed of presentation, the shortening of the design process by the skipping of many of its steps which were necessary in the physical implementation of projects, and the reduction of production costs and waste with the associated environmental benefits. Unlimited availability, and thus fascination in the audience: every viewer is in the center of the presentation; moreover, they can freely "teleport", they are distinguished, always in the first row. There is no selection, no division into zones for the audience. The user can become a participant in the presentation, can be at the center of it, can even look inside a particular object or observe the scene from a distance. The use of this type of tool in commercial design and presentation of clothing is increasingly present.

The fashion industry has long ago found a number of applications for augmented and virtual realities: the virtual fitting, VR mirrors and virtual fashion shows. Already in 2017, at New York Fashion Week, the show "Dreaming of Italy" moved viewers directly to Milan. With VR headsets and special software we can enter showrooms of leading fashion brands without any time or space limits, or get an absolutely realistic impression of being present at some of the greatest shows of our time.

A strong and very topical example of this is the last campaign of the Balenciaga autumn/winter 2021 collection. This French brand used VR tools to create a virtual fashion show, lookbook and a campaign to promote collections in the form of computer game "AFTERWORLD: The Age of Tomorrow".[8]

7 Virtual Reality Provides New Tool for Fashion Design Class; Illinois News Bureau; 21.12.2020; online https://news.illinois.edu/view/6367/1329212207; accessed on 07.03.2021

8 Online: https://videogame.balenciaga.com/en/, accessed on 07.03.2021

Figure 16: Balenciaga. The Game; source: https://videogame.balenciaga.com/en

Figure 17: Balenciaga. The Game; source: https://videogame.balenciaga.com/en

Figure 18: Balenciaga. The Game; source: https://videogame.balenciaga.com/en

Balenciaga, instead of traditional invitations to the collection show, sent Oculus glasses to 330 guests around the world, inviting them to the virtual reality show.[9]

The video game, which serves as a showcase for Balenciaga's autumn 2021 collection, was custom designed by Unreal Engine, the world's most advanced 3D creative platform.

Designer Demna Gvasalia imagined a mythological space adventure set in 2031, where players explore five levels, from a virtual store of the brand to a dark forest and a picturesque mountain top at sunset. The 50 avatars are dressed in neo-medieval outfits and the surrounding visuals depict future worlds that have been destroyed by political unrest and climate change. Despite the drama of the script, Gvasalia's end message seems to be optimistic.

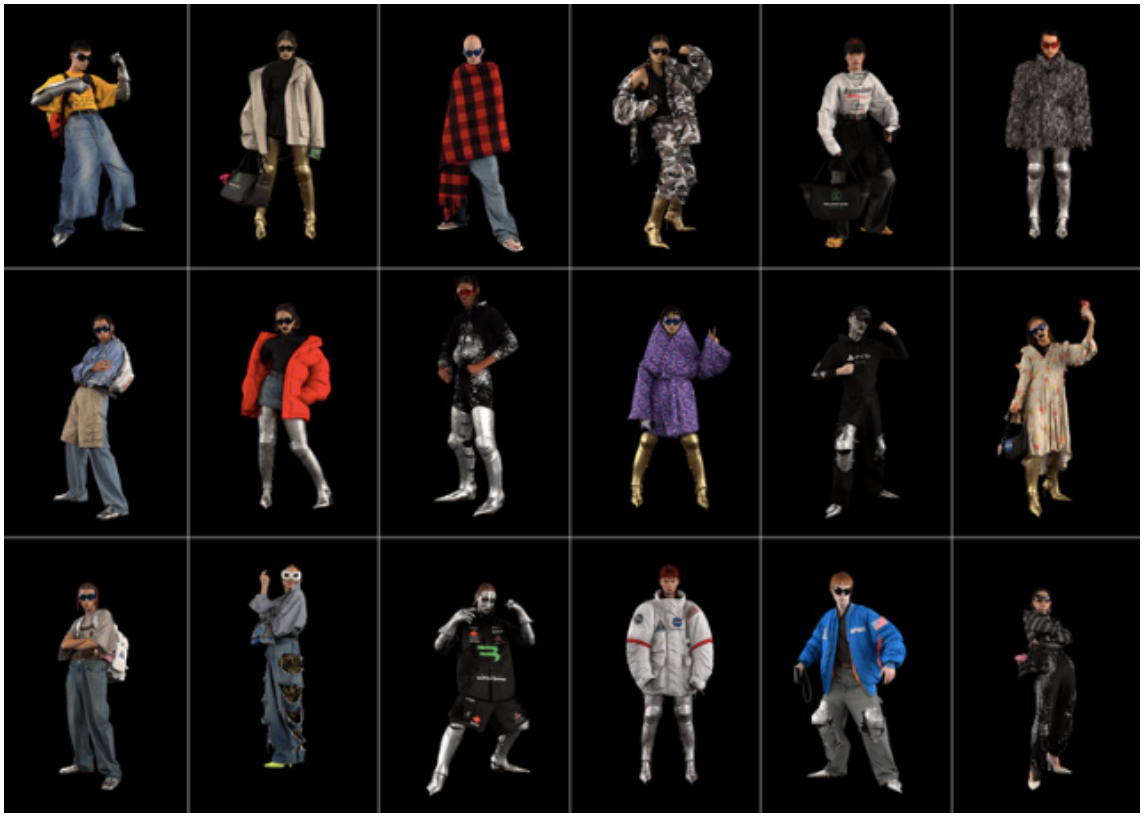

Figure 19: Balenciaga Lookbook; source: https://videogame.balenciaga.com/en/looks

9 VOGUE, https://www.vogue.co.uk/news/gallery/balenciaga-autumn-winter-2020?image=5fcd17bc94cc0b65da0f151f; accessed on 07.03.2021

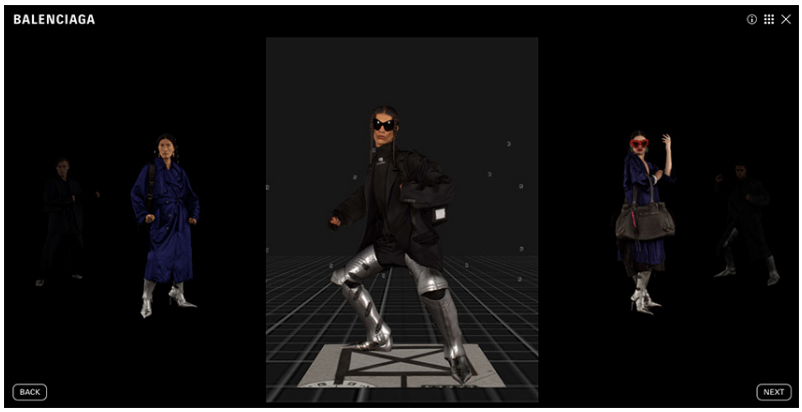

Figure 20: Balenciaga Lookbook; source: https://videogame.balenciaga.com/en/looks

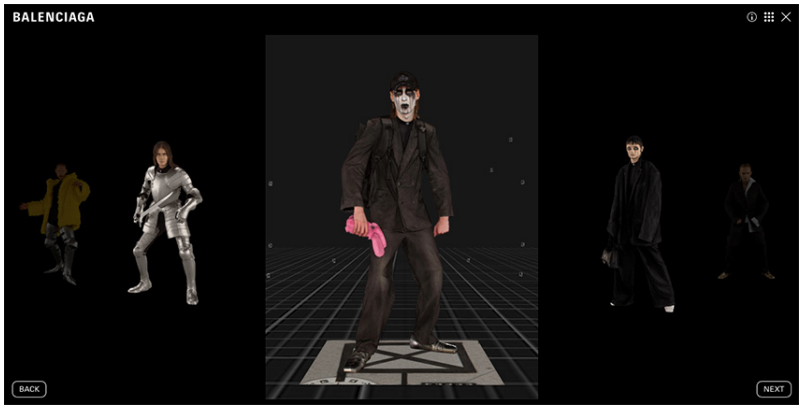

Figure 21. Balenciaga Lookbook; source: https://videogame.balenciaga.com/en/looks

Figure 22: Balenciaga, autumn/winter 2021 collection show; source: https://www.youtube.com/watch?v=Ge-DRlGuKt50

Figure 23: Balenciaga, autumn/winter 2021 collection show; source: https://www.youtube.com/watch?v=GeDRl-GuKt50

Brands such as Gucci, Tommy Hilfiger or Dior have been long implementing the VR in a range of their tools, mainly marketing ones. They started to present their collections in the VR space a few years ago.

In retail commerce, virtual worlds expand user experience by opening digital playgrounds for the presentation of products. Tommy Hilfiger and Burberry rely heavily on the VR and AR technologies in the creation of not only virtual boutiques. Burberry's physical showroom in Shenzhen uses the WeChat Mini augmented reality program to share virtual content hosted by a digital fawn. However, no brand other than Balenciaga has treated the entire process of designing, creating and presenting collections so holistically.

But soon the avalanche will rush down. Future designs will be unleashed, coming directly from the imagination, without physical restrictions on virtual fashion shows, so that audiences leave with a "sense" that these are the best outfits they have ever worn – even without putting them on.

The impact of digital design processes will be transferred to hyper-expressive physical products that will combine digital and real aesthetics, as if they were created in a dream.[10]

3. A new space for imagination

The ability to design in the VR is a real breakthrough that opens up completely new perspectives. From the first stage of work, we can view the solid inside and outside in space, check the proportions, layout, fit and make changes on the fly in real time.

The use of the VR technology as a tool is becoming a norm. Both in teaching and in the fashion industry. Applied as early as at the learning step, the technology allows you to get to know the present workshop in depth. By training future designers in the VR technology, we give them an additional,

10 Future Innovations 2023, WGSN forecast team, online: https://www.wgsn.com/en/, accessed on 25.02.2021

now precious, skill which becomes a strong asset. It will allow them to function freely in the modern commercial world where digital technologies are increasingly replacing the physical workshop and the conventional creative process.

The fashion industry sees the potential of immersive technologies that will revolutionize every element of creation and communication.

And not just because of the CoViD-19. The pandemic has caused the whole process of implementing such tools to go a little faster, but it was not the main cause. The project to implement the VR technology into the curriculum of the Textiles and Fashion Design Studio appeared much earlier, long before the pandemic chaos started to reign. The idea was brought to the world on the initiative of the Fashion Start-up already in 2017. The plan – then visionary, designed by Anna Pyrkosz, the head of T&FDS, and by Anna Hanysz, the leader of the Fashion Start-up – to integrate new technologies as teaching tools in the design process has positioned the Studio among the pioneering implementers of the VR technology in the outfit design process.

A recent study in fashion design education, conducted in the first half of 2020 at Yionsei University in Seoul, at the Faculty of Human Environment and Design, focused on potential benefits of the immersive VR environment used in fashion design.[11]

The research presents an instructional process for designing and developing an educational program for fashion design, which promotes creativity in the VR environment.

In addition, a multidimensional assessment was carried out to obtain more educational information and to develop an instructional model based, as in the case of the VR Fashion Design Workflow 1.0, on the Tilt Brush VR software. The assessment brought to light a new perspective on the possibilities of using the VR to promote creativity in future fashion design education.

The impact of the immersive VR environment, as a design education tool, on designers' cognitive activities and increased creativity has been noted. One of the basic conclusions was the huge contribution from the VR technology on flexible thinking and ingenuity of designers.

T&FDS students also repeatedly pointed out during the workshop program that the tool gave a strong stimulus to their ideas. Often the previously assumed design of a silhouette, underwent a complete transformation after its introduction to the VR space, opening up to new possibilities and variants.

11 *The Use of VR for Collaborative Exploration and Enhancing Creativity in Fashion Design Education*, Jee Hyun Lee, Eun Kyoung Yang, Se Yeong Min, Zhong Yuan Sun, Bai Jiao Xue, 15.12.2020, online: https://www.tandfonline.com/doi/full/10.1080/17543266.2020.1858350?scroll=top&needAccess=true, accessed on 07.03.2021

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4. Digital fashion is becoming a norm – digitizing processes

Fashion reflects its times. What it represents, how it is worn, how it is offered and presented. And, finally, whether it is physically present or not; or is only in the space of imagination, game, dream. The ability to design in virtual space, digitize fabrics, "sew" digital clothing, create virtual samples, simulate, animate, show virtual fashion or "play a game" helps you optimize work, save on fixed costs, speed up processes, be part of the "sustainable development" and tell the story that builds the community. Demand for digital clothing continues to grow, forcing a contactless environment in educational and industrial applications.

Being a fashion designer nowadays is not just about making clothes. To be a good "player" in this super-league, you need to be a multimedia platform. You need to create videos, powerful lookbooks, simulations and digital models. You have to be able to think virtually.

The possibility of presenting designs that have not yet been physically produced is becoming more and more desirable. Designers no longer send physical clothes to influencers, only digital prototypes of them, and not only because they pay more and it is healthier for the environment and sustainable design but also because influencers are already Computer Generated Imagers (CGIs). The virtual space is increasingly consuming us.

The question then arises whether clothing is still the most important, or will it become a side effect of the content of the virtual cross-platform outfit design process?

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