METAVERSE & SUSTAINABILITY in Fashion

OPPORTUNITY OR THREAT?
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The current climate trajectory is alarming, and the time to take traditional sustainability actions is long past. Increased consumer awareness and ambitious corporate declarations will no longer move the needle tangibly. Enter a new prominent digital trend: fashion in the metaverse. Digital fashion is no longer a possibility of the future—it is a present-day reality. By 2030, most fashion industry leaders will establish a digital presence, but what cost to the fashion industry’s sustainability goals will this presence have, or what benefit?

There is little consensus regarding the relationship between sustainability and technology. While some point to a substantial environmental cost, others see digital fashion as a disruptive force enabling the fashion industry to reach its ambitious sustainability targets by reframing the system and revising old habits.

Until recently, the Ethereum blockchain consumed around 84 TWh of electricity each year, comparable to the consumption of a medium-sized country such as Finland. The change in consensus mechanism that took place in September of this year has reduced its energy consumption by more than 99%, demonstrating how crucial the choice of technology is, a choice that fashion industry leaders will need to make themselves as they enter the metaverse. The time to act and to use technology to the advantage of the environment is now. Climate change will not wait, and neither should we.
Last year, 20% of digitally aware people aged 18 to 25 purchased physical clothing for the sole purpose of taking a picture or video and posting it on their social media. Young people increasingly use social media to show off their style, seek inspiration, and curate their individual image. Therefore, what is exclusive and one-of-a-kind remains in great demand. However, oftentimes, physical clothes are bought for one-time use and later returned or discarded, thus generating further pollution and waste.

Could digital fashion be the answer? Boston Consulting Group and Vogue Polska have jointly produced a report on sustainable fashion, business, and the booming virtual asset industry. The digital fashion sphere is generating real revenue, and brands active in the metaverse are rapidly gaining more buyers. Non-fungible tokens, which enable ownership of original, branded digital art and fashion, are game changers. As the first data from BCG’s global survey shows, the number of digital users interested in buying NFT in the next 12 months triples the number of current NFT holders. Among NFT holders, 19% have purchased virtual clothing or accessories, 22% have bought in-game accessories, and 62% have purchased digital artwork. Fashion companies have the reason and tools to enter this new digital realm, but to ensure that it does not come with an increased carbon footprint, industry leaders need to keep sustainability at the forefront of their agendas.
EXECUTIVE SUMMARY

Climate concerns have long plagued the fashion industry, and despite collectively mobilizing to reduce emissions, much remains to be done. Efforts to introduce new regulations and policies, such as setting requirements for the longevity and recyclability of apparel, have the potential to transform the industry’s commitment to sustainability even further. Fashion brands must comply with these upcoming regulations, a task that does not come without challenges, given the unstable politico-economic climate of today.

Meanwhile, a new prominent digital trend—fashion in the metaverse—is on the rise, and there is little consensus regarding its impact on sustainability. The metaverse, considered the next generation of the Internet, is a virtual reality strongly linked to the physical world. While the vision is still in its initial stages, leading to various interpretations and definitions, it is undeniably exciting and versatile. For the fashion industry, the potential of the metaverse lies in its intersection of three groups of technologies.

- Augmented reality, virtual reality, and extended reality
- Metaverse platforms
- Web3, collectibles, and NFTs

Although digital fashion originated in gaming with avatar outfits known as skins, in the metaverse, nothing limits a designer’s imagination. Metaverse fashion can look like augmented reality clothing, digital art, or even phigital items that connect physical and virtual realities. Several forward-thinking brands have already created digital spaces on metaverse platforms, while others have launched NFT drops alongside well-known virtual designers. As a whole, the fashion industry is rapidly embracing the metaverse. Our analysis shows that in the two years since the trend began, one-third of the world’s 120 leading fashion companies have already experimented with the metaverse. These brands are discovering, learning, and earning in the process. We estimate that since Nike’s acquisition of digitally native brand RTFKT, the value of the first three Nike x RTFKT NFT drops equates to $250 million—two-thirds of market share in the $360 million market value of the fashion NFT collections launched in 2022.

With thousands of NFTs already created and millions of dollars already traded on the market, one thing is clear: this is just the beginning. Despite early problems of the metaverse—such as concerns over the graphics quality, data streaming limits, and the inability to move assets around various, coexisting spaces of the metaverse—the opportunities are attractive for brands, as they open new ways of engaging with customers and community building.

We acknowledge the metaverse may sound like an abstract notion to the general audience and that many are skeptical about it, fearing it will reduce face-to-face interactions that we all value. However, we see the metaverse not as a revolution but as a gradual evolution of the internet we know today. In our view, while a gradual progression, we may all live in the metaverse sooner than later. Our research indicates that consumers increasingly care about their digital presence, especially in Asia, where 45% of digital users answered that their digital appearance is equally as important as their physical appearance.
We expect that by 2030, most fashion industry leaders will have entered into the metaverse. We estimate that in the base case, this could translate into extra revenues of $25 billion a year, out of which:

- $6 billion would come from video game skins offered through fashion brand and gaming company collaborations. Worldwide, there are nearly 3.2 billion gamers. Video game skins are a fast-growing category of in-game microtransactions. Fashion companies can increasingly tap into this lucrative market. In our survey, 18% of gamers declared they would be more likely to buy skins from established fashion brands if such skins were available.

- $6 billion would come from digital fashion, including avatars and avatar wearables, augmented reality photo overlays, and 3D try-on. The market for digital fashion is still young, dominated by a handful of digital fashion startups. However, fashion industry leaders are well-positioned to win market share in digital fashion against these newer, digitally native brands or to engage in successful partnerships. In our survey, established luxury and sportswear brands were top picks for purchasing digital fashion: 36% of respondents would consider luxury brands, and 34% sportswear brands.

- $13 billion would come from NFT drops launched by the fashion industry. In our survey, NFTs were the most promising digital asset class—the number of digital users interested in purchasing NFTs in the next 12 months would nearly triple the number of current NFT holders. We see the most significant market opportunity for NFTs in categories with higher price tags, such as luxury and premium sportswear. These brands could leverage NFTs to ensure their digital products are as exclusive as their physical items, and capitalize on innovative technology such as digital twin, which is a virtual replica of a fashion item containing crucial information about the product, including its technical parameters and materials used. Other technologies to utilize include proof of authenticity and token-gated access, which allows a brand to restrict access to certain content to holders of a particular token or NFT.

In a bull scenario, assuming higher adoption rates, our predictions are twofold, reaching $50 billion in total by 2030.

As fashion in the metaverse scales up, there is still no consensus regarding the impact on the industry’s sustainability goals. While some point to a substantial environmental cost related to metaverse technologies, particularly blockchain, others believe that digital fashion could be a disruptive force enabling the fashion industry to reach its ambitious sustainability targets.

The fashion industry currently accounts for 5% of CO2 emissions globally, and digital fashion, especially NFTs, carries its own carbon footprint via excessive technology use. We analyze three fundamental questions to understand whether the metaverse is a sustainability threat or an opportunity for the fashion industry. First, what
is the technology used to create and trade fashion in the metaverse, and what is its carbon footprint? Second, can digital fashion replace any physical production, or is it complementary? Third, can digital technologies help fashion companies reduce CO2 emissions from their traditional business?

To understand the fundamental importance of the technology used to create and trade fashion in the metaverse in regard to sustainability, we have hypothesized three scenarios: a high carbon metaverse, a light carbon metaverse, and the metaverse as a force for good.

In the first scenario, a high carbon metaverse, we analyze worst-case impact. If fashion in the metaverse is fully incremental to physical fashion and the current blockchain NFT mix applies with 80% of NFTs minted on a blockchain using proof-of-work consensus mechanism, we estimate that by 2030 the metaverse could increase fashion industry emissions between 0.6% and 1.2%. Fortunately, this scenario is unlikely to materialize as technology is evolving right before our eyes. On September 15, Ethereum, the most popular blockchain used for NFTs, changed to a proof-of-stake consensus mechanism, reducing its energy usage and carbon footprint by over 99%. This fundamental change has provided a remedy to broad criticism that NFTs have a staggering environmental impact.

In the second scenario, a light carbon metaverse, we assume that blockchain sustainability is addressed and, going forward, the metaverse is built using sustainable and energy-efficient technologies, such as, Ethereum with proof-of-stake consensus mechanism or second layer blockchain. In such a scenario, fashion in the metaverse would generate only up to 0.1% of additional CO2 emissions by 2030.

In the third scenario, the metaverse as a force for good, we consider the additional sustainability opportunities brought forth by the metaverse. Could digital fashion partially reduce physical clothing purchases? Our survey respondents are skeptical, yet one in five digital users between the ages of 18 and 25 reveal they occasionally purchase apparel specifically for digital content creation. The popularity of hashtags such as #haul or #unboxing highlights the magnitude of this phenomenon. Creating this content can come at a significantly smaller cost to the environment with the rise of digital fashion.

Digital innovation also presents excellent opportunities for fashion players to reduce overproduction and, subsequently, carbon footprint. New solutions in product development such as 3D design could help significantly reduce physical samples and shorten time to market. Virtual showrooms and 3D try-on could help reduce the number of returns. We estimate that for every 1% reduction in overproduction, the CO2e emissions of the fashion industry would decline by between 0.2% and 0.4%.

As the world of fashion enters the metaverse, it is vital to incorporate sustainability mechanisms from the start before it faces exponential growth that could rapidly scale up environmental costs and threaten the industry’s sustainability aspirations. Fashion companies should not only make conscious technology choices for their own metaverse endeavors, but also help set sustainable standards for the metaverse. Consumers often do
not realize the environmental impact of digital purchases. At the same time, the metaverse opens a window of opportunity—a chance to disrupt the industry and use digital technology to benefit the environment. It is up to leading fashion brands to enter into the metaverse and become sustainability innovators and disruptive forces of digital fashion.
ABOUT THE REPORT

Since our first report was published in 2021, the average global temperatures have been persistently increasing, calling for actionable solutions and urgent preventive measures to be taken by consumers, corporations, and regulators alike. Amidst the progressive sustainability targets and bold proclamations, we see a rising new trend: the fashion industry increasingly engaging with the technologies of the digital world, putting the relationship between sustainability and technology in question. For example, Tesla, which heavily invested in Bitcoin early on, recently withdrew from the crypto world due to concerns over its climate impact. Such moves have added further uncertainty to the already highly volatile cryptocurrency market. Within this context, the fashion industry, although rapidly embracing the metaverse world, continues to have valid concerns about the environmental aspects of the metaverse. The environmental cost of metaverse technologies is a bone of contention—while some raise environmental concerns, others stand behind the idea that tech may enhance the sustainability of the fashion industry.

This 2022 report, the first such comprehensive analysis of the impact that fashion in the metaverse could have on the environment, focuses on analyzing digital fashion in the context of ambitious sustainability targets set forth by the fashion industry. While digital fashion offers solutions to dismantle old consumption habits and minimize overproduction, it continues to be an extra consumption source with the potential to generate environmental costs.

Chapter 1 takes stock of the current sustainability landscape within the fashion industry and the changes made since the first publication of the Vogue Polska x Boston Consulting Group report in 2021. In turn, Chapter 2 reveals how the world of fashion has entered the metaverse. The results of our proprietary research and analytical results are presented in Chapter 3, where we estimate the fashion market size in the metaverse and its potential impact on the environment, measured in terms of CO2 emissions. Lastly, Chapter 4 presents the benefits fashion companies stand to receive from entering the metaverse and key takeaway points on how to infiltrate the metaverse sustainably.

The fashion world has only now begun to build technological awareness. Without the ability to self-regulate, the industry needs sustainable innovations and initiatives. Although it may be challenging, this is no excuse for inaction—the fashion industry has never feared a challenge, instead thriving on the opportunity for innovation in creation. Now is the time to truly create innovative changes to reduce greenhouse gas emissions and elevate the sustainability agenda.

For the report’s purposes, we organized a dedicated photo shoot that took place on the Baltic Sea coast in Poland in July 2022. The model has been subsequently dressed in purely digital clothes and accessories by DRESSX. You can see the photos from this session throughout the report.

Photographer: Mateusz Grzelak
Styling: Kasia Mioduska
Make up and hair: Kama Jankowska / Art Faces
Model: Finita Laura / Model Plus
Photographer’s assistant: Adam Kurlanc / Studio Daylight
Production: Kasia Kryehowska

In addition, the report is accompanied by a unique collection of 25 NFTs designed by Magda Butrym. 5 are redeemable for products from Handmade collection.
Since the Vogue Polska x Boston Consulting Group (BCG) report *Consumers’ Adaptation to Sustainability in Fashion* was first published in April 2021, many fashion companies have reaffirmed their ambitions to reduce their atmospheric greenhouse gas (GHG) emissions to net zero by 2050 or sooner. At the United Nations Climate Change Conference (COP26) in November 2021, 130 retailers and 41 organizations signed the Fashion Industry Charter for Climate Action, pledging to cut emissions by 50% in the next ten years. The pledge is stricter than the one made by 32 fashion leaders at the September 2019 G7 summit in Biarritz, where they pledged to cut emissions by 30% in the upcoming decade. Fashion companies are also making other sustainability pledges related to reaching this target, including some...
of the industry’s largest companies like H&M, Inditex, Kering, and Nike. The commitments are ambitious but much needed: in 2021, the fashion industry was responsible for around 5% of greenhouse gases emitted globally, placing it as the third most polluting industry worldwide.

Despite these commitments, the industry has a long way to go. The US alone throws away up to 11.3 million tons of textile waste annually—around 2,150 pieces of clothing each second. While these numbers sound abstract, consumers are beginning to comprehend their enormity. In November 2021, pictures from the Atacama Desert, where an estimated 39,000 tons of secondhand clothing are discarded yearly, were widely shared by dozens of newspapers globally, drawing the public’s attention to the issue. There are also industry concerns about greenwashing and data credibility. In June 2022, the Sustainable Apparel Coalition, a global nonprofit alliance for the fashion industry that coordinates the tracking of environmental waste and emissions, suspended its Higg Index “seal of approval” after its data was challenged by the Norwegian Consumer Authority.

To build credibility in the eyes of consumers, fashion companies need to take tangible action to genuinely reduce GHG emissions and other effluents, with visible success during the next five to ten years. As an industry, brands need to aspire to inspire when it comes to sustainability. For example, Kering developed an innovative tool for measuring and quantifying the environmental impact of its activities. It openly published its Environmental Profit & Loss account methodology, providing an open-sourced tool for others. Kering is just one example of how an individual company can enable the industry to unify and move toward a more sustainable future together.

CONSIDERING THE COMPLIANCE COMPONENT

While sustainability commitments must be at the forefront of fashion companies’ initiatives, it is crucial to consider compliance with equal care. In 2021, COP26 highlighted the consumer demand for sustainability standards. The UN Fashion Industry Charter for Climate Action upgraded its targets to slash emissions and added LVMH as a first-time signatory. The conference led to an agreement among fashion brands to jointly halve their emissions by 2030, focus their communications on reaching 1.5°C or science-based targets by 2030, and achieve high transparency in their use of new technology. The gathering also publicly requested that policymakers explicitly encourage the use of more sustainable materials. As noted by the UN International Panel for Climate Change, results will be “highly contingent on innovation, commercialization, and market uptake policies.”

Conceptually, COP26 placed much of the burden for mitigation and change on the wealthiest and most powerful countries and people. This is because the wealthiest 10% of the global population produces about 40% of global GHG emissions, while two-thirds live in high-income regions and the rest in emerging economies. Some US and European regulators are already establishing policies that can transform industry practices. The EU Strategy for Sustainable Textiles is an initiative designed to help the EU shift to a climate-neutral, circular economy by setting requirements for longevity and recyclability of
apparel by 2030, with responsibility accruing all along the value chain. The requirement for textiles to be longer-lasting and easier to repair will encourage innovation such as fiber-to-fiber recycling and other support infrastructure while reducing incineration and textile landfills. In New York, a bill currently under consideration by the state legislature would be the first in the US to place sustainability requirements on companies doing business there. In the UK, a governmental committee recently recommended a tax on virgin plastic that would mean a rise in the price of synthetics, making natural resources more attractive. As with labor-related bills, California’s recent establishment of a $14 minimum wage for garment workers is setting a precedent, as it holds companies and retailers liable even for violations with third-party partners in the supply chain.

THE SUPPLY CHAIN: CHALLENGE OR OPPORTUNITY?

While compliance is essential for regulators and fashion companies alike to consider, fashion companies are also carefully considering the three scopes defined by the GHG Protocol, the most widely used accounting standard to measure carbon emissions. Scope 1 emissions are those released from a company’s manufacturing, distribution, and functional operations that it either owns or controls directly. Scope 2 emissions are related to power generation, such as electricity, steam, heating, and cooling, and are purchased indirectly from utilities or other sources. However, by far the most significant emission reduction opportunity for the fashion industry exists within Scope 3 emissions, the emissions that focus on the impact of the value chain.

According to a World Economic Forum and BCG report, up to 85% of the fashion industry’s carbon emissions stem from distributors and suppliers, tracing back to raw material producers such as cotton growers. To illustrate, Polish apparel group LPP produced 4,420,67 t CO2e in Scope 1 and 11,985,14 t CO2e of Scope 2, however, its Scope 3 emissions were 180 times higher than its Scope 1 and Scope 2 emissions combined. The fact that LPP measured and reported its Scope 3 emissions is notable—it is the first time the group has done so. Problematically, not all fashion brands focus on Scope 3 emissions. According to the 2021 BoF Sustainability Index, half of the biggest apparel manufacturers have yet to establish goals to cut Scope 3 emissions.

The time for rethinking operations on a broad scale is now. The pandemic has disrupted the complex production supply chains of fashion. With the rising cost of shipping and raw materials, some fashion players are turning to nearshoring, bringing production closer to their end markets and thereby reducing operational complexity and dependence on suppliers. In 2021, Benetton moved 10% of its production from low-cost manufacturing hubs in Asia to manufacturers in Tunisia, Serbia, Croatia, and Turkey, closer to its Italian headquarters. It aims to halve its production in Asia by 2023. The German fast-fashion company C&A opened its new textile factory near its Düsseldorf headquarters. Fashion companies can improve their carbon footprint and bottom line by restructuring their supply chains and choosing responsible suppliers.
In addition to these more traditional methods of addressing Scope 3 emissions, some companies, like Uniqlo, are experimenting with micromanufacturing and on-demand digital fabrication. These emerging trends have the potential to advance rapidly—and they also present the opportunity to advance sustainability rapidly.

THE ONLY CONSTANT IS CHANGE

The fashion industry must rethink its business model to meet sustainability targets, which currently relies on consumers buying many clothing items and wearing them for a short period, leading to excessive waste, overproduction, and GHG emissions. However, so far, fast fashion is not in retreat. Fast-fashion company Shein, the world’s largest fashion retailer as of 2022, adds around 30,000 new styles to its US website every day.16

Arguably, fast-fashion companies are aware of their environmental impact. Many of them have significant sustainability initiatives, and, in June 2022, Shein announced a $50 million donation to The Or Foundation, a non-profit that tackles the clothing waste problem in Ghana however sometimes these commitments instigate skepticism and accusations of greenwashing based on the argument that the rapid-discard business model is the root of the problem.17

Consumers are also beginning to evolve, especially as alternative models take hold. The current boom in the clothing resale and rental markets, both of which have existed for decades, signals the evolution of consumer values, particularly among the millennial and Gen-Z cohorts. For instance, estimates indicate the US secondhand fashion market will grow by 20% between 2020 and 2025, reaching $67 billion.18

Fashion manufacturers have taken note of this trend and are collaborating with resale platforms. For example, Alexander McQueen and Mulberry joined the Vestiaire Collective in promoting its Brand Approved resale platform, which offers fully authenticated and refurbished preowned products.19 The platform progressively expands through mergers and acquisitions to gain enough scale to remain profitable. In March 2022, Vestiaire acquired Tradesy, another resale platform. Peer-to-peer marketplaces are also on the rise—In 2021, online marketplace Vinted surpassed $4 billion in valuation, up from $1 billion at the end of 2019.20

While decreasing waste and overproduction, the secondhand fashion market also promotes the concept of circularity. The circular fashion industry is one in which garments are circulated for the duration of their maximum value and then returned safely to the biosphere. According to the 2021 Material Change Index, 46% of the 292 participating fashion companies said they are working on implementing the circularity concept.21 Fashion leader Tommy Hilfiger has trained nearly 70% of its designers on circular design principles, including remanufacturing durable denim, and, in 2021, the company successfully launched its first Jeans Redesign collection of twenty garments produced in line with the requirements of the Ellen MacArthur Foundation’s Jeans Redesign Project.22 Its guidelines set out minimum requirements on garment durability, material health, recyclability, and traceability—critical components in creating
a circular economy.

The innovation of supply chains is a meaningful sustainability step, but perhaps the most critical factor for reducing Scope 3 emissions and achieving sustainability targets is funding. Without investment in overhauling the supply chain, including a switch toward renewable energy and the production of next-generation fibers, the industry will not reach its climate commitments and decarbonization objectives. According to Fashion For Good and the Apparel Impact Institute, about $1 trillion is needed to decarbonize the industry by 2050. This amount includes $380 billion for renewable electricity, $272 billion for next-generation materials, $218 billion for sustainable materials, $153 billion for coal phaseout, and $22 billion for energy efficiency.

It is imperative that companies tangibly address their Scope 3 emissions, yet, on the horizon, there is an exciting opportunity to advance the supply chain business model of the fashion industry toward an even bolder vision: sustainability through digital technology. Predictions are that 3D fabrication and digital development processes may lead to a 70% reduction in sampling and a 40% reduction in time spent on product development. Levi’s has recently reported that it plans on shifting to “global virtual line assortment meetings using photorealistic 3D renderings of denim garments and samples.” This digitalization will enable the simultaneous involvement of several teams and finish the process—one that would usually take weeks—in one sitting. Moreover, it will pave the way for facing a significant change in the fashion world: the arrival of the metaverse.

In Chapter 2, we will explore how the world of fashion has embraced the metaverse. Enthusiasts say that digital fashion can help reduce overconsumption and waste, while critics point to the additional carbon footprint, especially of blockchain-based NFTs. In Chapter 3, we will thoroughly analyze the impact of fashion in the metaverse on the fashion industry’s sustainability ambitions.
What is your digital fashion story? When I first heard about spending money on clothes that do not really exist, it didn’t make sense to me. A few of my influencer friends were buying digital clothes to wear on social media platforms. It made me curious, also I work in tech, so I wanted to try it to see how it worked. I wanted to learn the how and the why.

What was your impression of your first purchase? I bought a few digital dresses and posted pictures of myself “wearing” them. The result was surprising—a lot of my followers were commenting, liking, posting, and resharing. Not only was the result amazing, but so was the process. Digital shopping is so easy and fun; you can choose the proper fit and customize pieces for yourself, which is hardly possible in the traditional shopping environment. I also purchased virtual real estate to test things out and check the transactions mechanism, the user interface and the overall experience. Sometimes the user experience is not as smooth as you would expect, but these new
platforms are developing fast and getting better every day.

**How important is sustainability in digital fashion?** I bought virtual jeans, bags, dresses, and jewelry to support the environment and to also advocate for less obsessive fashion consumption. It was fun, inexpensive, and good for the planet. I also believe that the 3D design has the potential to make the industry more environmentally friendly. One of the problems is the low adoption rate and lack of education. Digital goods are not only for savvy tech users. We need to give everyone enough information and time to try, fail and adapt. One day, today’s revolutions will be the traditional tech.

**Do you think digital fashion is a luxury or a necessity?** I believe that the metaverse is becoming a necessary part of our lives. Some of us are already living in the digital world, and have our own digital brand and presence. In this digital world, we will need art, digital land, house, investment, and of course digital clothes, cool shoes, impressive bags and accessories, as per our needs and wants. I am sure in the future I will have more everyday digital presence and it will become as important as my physical presence and surroundings. It is a normal tech evolution process and there is nothing to be afraid of.

**Do you look at digital NFTs as an investment or something you would like to have for yourself?** For me, NFTs are the opportunity to donate and support a good cause. For others, it is a good strategic financial investment. Despite the volatility of NFTs now, I believe that in a few years, they will be skyrocketing. Still, you need to be extremely smart in your purchases now—it is still a fresh market. We do not have many experts who can advise on it.

**What do you think is the future of digital fashion?** There are currently only a few players in digital fashion. It is futuristic and exciting. In the future, it might become as common as buying a white shirt for a business meeting. We will be building parallel lives. I might have an avatar looking exactly like me or express myself completely differently if that’s how I want people to perceive me. If we use this opportunity morally, without corruption or trolling, it might have a positive impact. I strongly believe that digital fashion and virtual world have the potential to change the consumer environment. We are all moving forward. We need to start advising people about the digital way of living. We need to start thinking about our digital presence and how it can have a positive sustainable impact on the real world.
“HELLO”
gamer, on digital stickers and skins

“Hello” is the pseudonym of an experienced video game player

What do you think of the metaverse? I am totally against it! I deleted my Facebook account, and I rarely use social media. I wouldn’t want people to live in a virtual world, like in The Matrix.

But you play games and buy skins. Do they give you any extra skills or advantages in the game? I am playing Counter-Strike [a multiplayer shooter video game]. This game is all about skills. There are championships where the best teams compete for prizes. It would not be fair if you could buy skins giving you any extra advantage, so you can only buy decorations that are purely aesthetic.

So, can you change the appearance of your avatar? Yes. In 2019 agents—full-body characters—were added to the game. You can buy skins that change the look of your character. However, when you play, you can mainly see the avatar’s hands and weapon. Players buy gloves for their hands, skins for their weapons, and stickers that can be displayed on a gun.

Are these purely aesthetic game elements expensive? Some limited edition capsules, like those released for the first Katowice Major [Counter-Strike world championship], are legendary. Stickers from them, can trade for more than $40,000. The most expensive exceeded $70,000 recently.

What marketplace would you use to sell game assets? Players can sell and exchange their skins on Steam, a platform that combines a digital game store and social media. Selling skins there has some drawbacks: each sale is taxed and there is a price limit of $1800. As a result, trades of more expensive items happen on third-party websites.

What else do you buy, apart from skins and stickers? I recently bought a music box.

A music box? Yes! Once while attacking the other players’ base, I stumbled upon a music box. It was beautiful, and I fell in love.
with the music coming out of it. I just had to buy it.

What game was it in? Rust. It’s a survival game where players start with nothing and need to survive. I play it with my friends Voltair and Crazyblack. When we play it, we can spend as much time as 90 to 100 hours weekly in a two- or three-week run. This game is like a full-time job. Do you know that I never met Voltair in person?

So, you are against the metaverse, but some weeks you spend dozens of hours in a virtual world with people you never met face to face? Yes, that’s right. But after a few weeks of intensive play, we take a step back to rest and enjoy real life. Every year I also organize a party, during which we all eat, chat, and play video games together. I hope Voltair joins us this year so that we finally meet in person!
The metaverse—a virtual reality space seen as the next generation of the internet, interconnected seamlessly with the physical world—is an exciting opportunity for the fashion industry. While the use of digital clothes originated in gaming with designer avatar skins, many traditional fashion houses are beginning to engage with their customers in the metaverse. Trends in this new reality include NFTs, augmented reality clothes, and phygital retail. Some fashion brands have created their own spaces on metaverse platforms or acquired digitally native brands, while others have released NFTs in partnership with trending digital designers. Although the metaverse has captured the interest of fashion industry innovators, the technology is still new and imperfect, with practical concerns about graphics quality, data streaming, and interoperability at times limiting the imagination of creators.
Confusing, exciting, and versatile: these are all adjectives used to describe the metaverse. The word metaverse comes from the Greek term "meta" (meaning "beyond") and the English word "universe". Although the metaverse describes a new version of reality that combines the virtual and the physical, it is still in its initial stages and not yet clearly defined. For example, Meta defines the metaverse as “a set of virtual spaces where you can create and explore with other people,” while Microsoft defines it as “a persistent, digital world that is connected to many aspects of the physical world”. Definitions may differ, but everyone can agree that the metaverse is an exciting new opportunity. Estimates indicate that by 2025, around 25% of the population will spend one hour per day in the metaverse. The metaverse intersects three groups of technologies:

- **Augmented reality (AR), Virtual Reality (VR), Mixed Reality (MR)**
  - Augmented reality: Integration of digital objects in the physical world, like the Pokémon GO game that showed digital Pokémon in real-life settings
  - Virtual reality: Immersion in 3D world without physical world interaction
  - Mixed reality: Convergence of AR and VR, like reaching for a physical object to hit a virtual opponent

- **Metaverse Platforms (M-platforms)**
  - 3D virtual worlds focused on social connection and user-generated content; key players include The Sandbox, Decentraland, and Roblox

- **Web3, Collectibles, and NFTs**
  - Web3: General term of the decentralized web, which includes cryptocurrencies
  - Collectibles: Digital items of value
  - NFTs (non-fungible tokens): Digital items that are unique and not interchangeable

While the fashion industry already uses many aspects of these three elements, the technologies remain mostly separate. The vision of the metaverse is to create a completely unified world where all metaverse platforms and technologies are connected, with users seamlessly traveling from one to another while maintaining their identities and assets.

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**METAVERSE**

<table>
<thead>
<tr>
<th>AR/VR/MR</th>
<th>M-WORLDS</th>
<th>WEB3/VIRTUAL ASSETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 million installed headsets</td>
<td>300 million to 500 million active users</td>
<td>30 million total NFT wallets</td>
</tr>
<tr>
<td>800 million mobile AR users</td>
<td></td>
<td>1 million active NFT wallets</td>
</tr>
<tr>
<td>$16 billion market</td>
<td>$40 billion in NFT assets</td>
<td></td>
</tr>
</tbody>
</table>

Sources: Matthew Ball; Bloomberg; ARtillery Intelligence; Binance Research; BCG Analysis; Note: 2021 figures
FASHION IN THE METAVERSE

Fashion has traditionally centered around physical items that the customer can wear and so digital fashion feels counterintuitive and abstract to some. Yet the average consumer has already encountered a metaverse clothing item, perhaps without even realizing it. A digital fashion piece might be seen on an avatar, a “skin” for a video game character, a digital photo overlay, an AR filter, or an NFT.

- Avatars are digital representations of a person in a virtual environment; avatars can take a variety of forms, but they typically look like humans
- Skins are fashion pieces for avatars used to personalize appearances, like clothing and accessories
- Digital-only clothes are showcased through digital photo overlay technology. Digital fashion is meant to digitally dress humans, not avatars, and is worn by layering virtual clothes over a photograph or video of a person online. These photographs or videos can be posted on social media, like Instagram or TikTok
- AR filters allow consumers to try on different virtual fashion items at home, such as through a smartphone app
- A fashion NFT is usually an image, a drawing, or a 3D model of a clothing item. Once purchased, the NFT owner can use it as a regular game skin, an AR item, or digital art, depending on the NFT features. What makes NFTs exclusive is ownership. NFT ownership is recorded on blockchain technology, and, as such, each NFT is a unique digital asset that can be sold and resold, sometimes with tremendous profitability or sometimes with a whooping loss. While regular AR filters are unlimited in supply and can be accessed for a small sum or even for free, NFTs worn as AR filters are limited or unique, with only the owner able to use the filter

THE RISE OF METAVERSE PLATFORMS

As the metaverse originated in gaming, earliest forms of metaverse, or proto-metaverse platforms often look like familiar online games. Avatars represent users who can interact with each other, complete challenges, and win digital currencies. Metaverse platforms are unique in that they emphasize user-generated content, real-life connections (avatars usually look like humans), and inter-player interactions. Participants socialize with friends in these spaces, even attending virtual concerts and talk shows.

Currently, proto-metaverse platforms have more than 500 million active users, and this number is growing. Some of the biggest players include Roblox, Fortnite, Zepeto, Sandbox, and Decentraland. Released in 2006, Roblox is built around virtual encounters and user-designed spaces. It has 202 million monthly users, including more than half of US children under 16. One surprising example of a digital fashion innovator is Fortnite, a combat game with around 80 million monthly users that launched in 2017. As Fillippo, a Fortnite teenage user from Italy, explained in an interview with us, “Fortnite is the game that really started it all, the visual aspect of
The avatar. On the item shop it’s about $5 to $20. I know very well that I don’t need it, but I still do it. I just want the skin. It is the same as in real life—you don’t need a $500 purse, but if you can afford it, you buy it.” Like Fortnite, Zepeto offers avatar creation. It has 20 million monthly users making it the largest metaverse platform in Asia by user base.32 While gaining in popularity, proto-metaverse platforms that are less game-oriented have substantially smaller user bases. Sandbox and Decentraland, for instance, have 300,000 mothly user base.

Proto-metaverse platforms provide an immersive experience for users. Apart from offering games, avatars, and competitions, these platforms

<table>
<thead>
<tr>
<th>AVATARS</th>
<th>AVATAR SKINS</th>
<th>DIGITAL ONLY CLOTHES</th>
<th>AR WEARABLES/TRY-ONS</th>
<th>NFTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital representation of a person</td>
<td>Fashion for avatars</td>
<td>Sophisticated, detailed designs</td>
<td>Sophisticated, detailed designs of wearables</td>
<td>Fashion NFT could be an avatar, a skin, a photo overlay, an AR wearable, but also a token redeemable for physical good, digital art, film and music</td>
</tr>
<tr>
<td>Avatars are canvas for digital fashion assets</td>
<td>Simple designs due to technical limitations</td>
<td>'Worn' by real people by placing digital items over photos</td>
<td>'Worn' by real people by placing digital items over people using AR functionality</td>
<td>Key differentiator is ownership rights thanks to blockchain technology</td>
</tr>
<tr>
<td>Used in video games, on metaverse platforms or on social media</td>
<td>The result is one image, the clothes cannot be re-worn in different contexts</td>
<td>Real-time effect</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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32. While gaining in popularity, proto-metaverse platforms that are less game-oriented have substantially smaller user bases. Sandbox and Decentraland, for instance, have 300,000 mothly user base.

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32.
have their own currencies used to make in-game purchases. Some currencies, like Roblox’s currency Robux, are only valuable in the game, while other currencies, like Sandbox’s SAND and Decentraland’s MANA, are used in the game worlds but also behave like independent cryptocurrencies. At top valuation, SAND had a peak market cap of $7.5 billion, while MANA reached a peak market cap of $10 billion. The currencies can buy in-game assets, including custom avatar skins, creating a market opportunity for fashion companies. As explained by Robert, a teenage gamer from Poland, “When you start playing, you start with this ugly, basic interface. Then you very quickly realize that others have skins that are shiny and colorful. Then, by comparison, what you have seems inferior in some way. You want to buy them to feel part of this special community.” While anecdotal, Robert’s perspective can partly explain what motivates teenagers—the main target audience of metaverse worlds—to make purchases on the platforms.

Industry leaders are aware of the market potential of game skins. Fashion companies that have already designed skins include H&M, Wrangler, Levi Strauss & Co., Louis Vuitton, Fendi, Dior, Givenchy, Kenzo, Prada, PUMA, Under Armour, and Dolce & Gabbana. Balenciaga offers seasonal collections on Fortnite, and Nike sells simulated Air Jordans on Fortnite where players can earn the ability to select a shoe color by completing a set of challenges. Additionally, Burberry has released game skins for the game Blankos Block Party, whose avatars are simulated vinyl toys, and will continue working with Blankos publisher, Mythical Games, hinting at the initial success of the partnership. We take a deeper look at fashion brands in the video game skins market in Chapter 3 of this report.

Beyond releasing skins for games, brands are expanding their customer base by creating their own spaces on metaverse platforms, which are free to enter. In November 2021, Nike launched “Nikeland”, its own digital space on Roblox. There, visitors play simulated sports games, wear Nike clothes, and design their own mini games. The concept proved to be popular—Nikeland had 6.7 million visitors from 224 countries in its first five months. Forward-thinking companies understand that the benefits of having a presence on a metaverse platform go beyond immediate revenue—these platforms also offer the opportunity for companies to use virtual marketing that translates into physical sales. Apoorv, a teenage gamer from India, shared his experience from Roblox: “If I’m interested in a particular pair of shoes and looking to buy them, and I see them in Roblox (avatars wearing these shoes) and they look good, I will be more willing to buy them.” This hints at a connection between virtual marketing and real-world purchases.

Vans Shoes and Gucci have also launched Roblox spaces. “Vans World” has simulated skateboard parks, while “Gucci Garden”, launched in May 2021 to mark the company’s 100th anniversary, gave participants blank avatars to collect virtual clothing and accessories for as they moved through a simulated floral environment. Gucci Garden closed after two weeks as intended, but Gucci reentered Roblox a year later with “Gucci Town”. Other brands with their own metaverse spaces include American Eagle Outfitters, Louis Vuitton, Givenchy, Kenzo, PUMA, Tommy Hilfiger, Ralph Lauren, Timberland, Forever 21,
and Adidas. Almost all these players established their metaverse presences in the past year, showing how rapidly the industry is evolving.

AUGMENTED REALITY

Today, an average internet user worldwide spends 147 minutes (about two and a half hours) a day on social networking sites. Many of these social networks such as Instagram or TikTok are image-based, with users creating their personal brands online. As online appearance gains importance, the opportunity equally exists for augmented reality apparel to gain popularity. This translates to shopping behavior. In our survey, 21% of digital users aged 18 to 25 have admitted to buying a fashion item for the sole purpose of posting content on social media. Since the clothes are not actually worn, perhaps there is no need for them to physically exist. The online marketplace DRESSX has already begun to make this futuristic fashion notion a digital reality of today. DRESSX customers can purchase virtual items that are fitted over their photo; the photo “wearing” the digital fashion piece can then be posted on social media. Olga Chernysheva, DRESSX Chief Sustainability Officer, explains that although the founders of DRESSX started by selling traditional clothing, “They noticed that many consumers would return an item days after buying it. Those consumers likely never planned on wearing the clothes—they wanted to take pictures in them for social media!” (See Interview Olga Chernysheva, page 34.) While digital fashion in the metaverse is still a niche led mostly by digitally native brands and independent designers, mainstream brands have begun to take notice. Bershka, which currently lists over 1000 stores in 71 countries, recently launched eight AR pieces in partnership with DRESSX. These AR fashion pieces are a budget-friendly alternative to their physical items, with prices ranging from $1.99 to $2.99, roughly ten times cheaper than a physical Bershka T-shirt.

AR technology not only allows customers to purchase digital fashion and create content with these purchases, it also offers consumers the opportunity to enter a dressing room and try items on, all virtually, of course! Although the AR technology for virtual try-ons has been evolving since the early 2000s, it rose in popularity during the heaviest lockdown months of the pandemic. Valeria, an early metaverse adopter, appreciates the precision that digital dressing rooms can offer, noting: “Digital shopping is so easy—you can choose the proper fit and customize pieces for yourself, which is hardly possible in the traditional shopping environment”. (See Interview Valeria Sadovykh, page 18.) One of the most prominent brands using this technology is Dior, which launched its Instagram AR filter Check’N’Dior in 2019, where users can virtually try on pieces from recent collections. We found examples of 39 publicly listed fashion brands using AR technology either for virtual try-ons or for other ways of promoting their products, over half of which are luxury brands, suggesting a strong interest from the luxury sector in this technology.

In addition to fully digital AR filters, some brands are tapping into phygital retail, which combines the physical with the digital. Carlins, a Scandinavian department store, released a $44 T-shirt with a special tracker spot on the front that allows owners of the otherwise plain T-shirt...
to visit the brand’s Instagram account and apply a range of AR filters that activate upon seeing the tracker. The idea is to fight climate change by giving consumers access to a variety of designs at no further cost to the planet.

NON-FUNGIBLE TOKENS (NFTs)
While augmented technology and avatar skins are somewhat established in the digital sphere, fashion NFTs are recent inventions. Non-fungible tokens are certificates of ownership of digital assets recorded on a blockchain. NFT can be compared to a certificate that a virtual product is original and unique and belongs to a single owner. Many different types of assets can be recorded as NFTs, including digital art, collectibles, avatars and profile pictures, metaverse land, art, photography and video, and music. Most commonly, however, NFTs are finding their way into the world of art. There has been an increase in NFT artwork sales, with the most notable being Beeple’s collage, auctioned at Christie’s for $69 million.\(^ {42}\)

Just as art NFTs have the opportunity to be incredibly lucrative, fashion NFTs are no exception. One of the pioneers on the market is The Fabricant, a digital fashion house with a large NFT collection. In collaboration with Dapper Labs and artist Johanna Jaskowska, the company auctioned off the first digital-only dress known as “Iridescence” for $9,500 in 2019.\(^ {43}\) The NFT owner could not wear the dress but could feature it in simulated photos and videos. In 2021, digital fashion house RTFKT made $3.1 million by selling 600 NFT sneakers in under seven minutes. The shoes were designed by 18-year-old crypto artist FEWOCiOUS, demonstrating how a young designer can make a reputation in the digital design space. The Fabricant and RTFKT later collaborated, selling their collections on a digital platform called the Dematerialised. In December 2021, Nike acquired RTFKT, signaling a new era of established market leaders in the NFT fashion market.\(^ {44}\) Even well-known supermodels have made their appearances in the metaverse, with the most recent example of Bella Hadid, who released CY-B3LLA, an NFT collection featuring 3-D scans of her face and body.

The entire NFT market valuation boomed dramatically in 2021 after internet-wide hype, the launch of several high-value collections, and the announcement by big brands of their intention to enter the NFT space. There is no consensus on market sizing methodology due to the difficulty of validating legit transactions (the non-genuine including mostly robots and wash-trading), but the growth was unquestionably significant. In 2020, $82 million was traded in NFTs, while in 2021 the volume rose to between $17 and $40 billion.\(^ {45}\) Despite declining cryptocurrencies, in the first half of 2022, $18.8 billion was traded in NFTs.\(^ {46}\)

According to our research, NFTs have already been launched by 25 of the 120 biggest public fashion brands by revenue. Most fashion NFTs have been launched recently: In 2021, there were 12 NFT collection “drops” that encompassed 50,000 fashion NFTs, while in 2022, there were 15 drops that contained 100,000 NFTs. Fashion brands can employ different strategies and NFT use cases when first entering the metaverse space to determine what best practices will lead to their success. Dolce & Gabbana’s luxury NFT
collection “Collezione Genesi” launched in 2021 with 9 NFTs, while the Adidas NFT collection “Into the Metaverse” launched in 2022 with nearly 30,000 NFTs.

NFT price range can be broad as well: boohoo sold their NFTs for $30 each, while the Dolce & Gabbana’s ‘Collezione Genesi’ NFTs sold for $600,000 on average. Even though the presence of fashion brands in the metaverse space is relatively new, established physical brands have the innate potential for digital value due to their established communities. Loyal brand consumers are attracted to the exclusivity of NFTs, which in turn creates pure trading value of the branded tokens. The exclusive nature of NFTs, and thus their value, can be further enhanced using digitally innovative marketing strategies. For example, when Nike airdropped a secret-box NFT with a promise of valuable and interesting content upon completing a series of challenges, the market price grew steadily at an average pace of 10% weekly over three months as the community gained popularity and challenge engagement increased. After announcing the final quest, the price skyrocketed by 68% in just nine days. In the case of the SUPERGUCCI drop, the community expected a stand-alone NFT with an additional handmade ceramic sculpture. When members were surprised with a second NFT that would only be airdropped to holders of the first one, the price increased by more than 30% in one day. However, when the free redemption period of the figure came to an end, the value of the NFT decreased by 40% over two weeks, never to return to previous levels.

Overall, we estimate the value of primary NFT sales by the largest traditional fashion players to be just over $30 million for collections launched in 2021 and around $360 million for those launched in 2022; this includes the value of all NFTs offered by fashion companies for sale. This estimate does not, however, include creator earnings that fashion companies receive from secondary sales. For fashion players, this is typically a royalty payment of 7% to 8% of the price paid by the new buyer from every re-sale.

Thus far, the market has been dominated by a few players. In 2021, Adidas generated the highest value with its Into the Metaverse NFT drop valued at just under $24 million at launch. This means that Adidas alone was responsible for most of the market value of fashion NFTs that year. While most likely only part of the proceeds went to Adidas directly as the company partnered with three creators for the drop, the success of the NFTs still shows how a single booming collection can dominate the market. In 2022, the biggest NFT fashion player has been Nike. Its first three NFT drops following the acquisition of RTFKT were valued at nearly $250 million at launch, meaning that Nike alone is responsible for two-thirds of the current market value of fashion NFTs. These numbers prove that, if done strategically, NFT drops can generate sizeable revenue for fashion companies.

**FASHION NFTs ON THE MARKET**

One popular strategy for brands entering the metaverse with NFTs is to connect the virtual with the physical. In June 2022, Prada offered an NFT to every consumer who purchased one of its 100 limited-edition Prada Timecapsule shirts. The Prada Timecapsule collection has released a new item every month since December 2019; its
reputation as a highly luxurious brand made the associated NFT desirable as well. Kenzo took a similar approach with its Boke flower collection of hoodies, cardigans, and coach jackets—it gave 100 NFTs with the Boke logo to customers who already owned a Kenzo garment and were registered on their website.

Adidas took a different approach with its entry into the metaverse. The company offered NFT digital collectibles, granting holders access to exclusive physical merchandise designed in collaboration with Bored Ape Yacht Club, PUNKS Comic, and GMoney. All three partners were already leaders within the NFT market, drawing attention to the Adidas drop. Bored Ape Yacht Club (BAYC) is a collection of 10,000 unique NFTs featuring profile pictures of cartoon apes generated by an algorithm and living on the Ethereum blockchain. Owners of a Bored Ape NFT are granted access to a private online club, exclusive in-person events, and intellectual property rights for the image. To illustrate its success, as of December 2021, BAYC had a market cap of $2.8 billion. They are so popular worldwide that even famous celebrities such as Justin Bieber, Madonna, and Neymar Jr. own at least one of them, increasing their desirability. On the secondary market, multiple BAYC NFTs crossed the $1 million mark, with the most expensive one auctioned for $3.4 million at Sotheby’s Metaverse.

Tareq Nazlawy, one of the leaders of the Into the Metaverse campaign, shares how he established the partnerships in our in-depth interview (See Interview Tareq Nazlawy, page 80.) Gucci similarly partnered with Superplastic in June 2022, releasing 500 limited-edition NFTs, each accompanied by an exclusive ceramic SuperJanky sculpture. Interestingly, through 2021, the top ten NFT collections had around 60% share of the total NFT market value.

NFTs, like art, often derive value from uniqueness and collective community interest. Fashion brand leaders recognize this digital consumer preference for exclusivity and have begun setting up NFT launches as online community events, often using the Discord group-chatting platform familiar to gamers and cryptocurrency followers. Though they take time to develop, NFT communities increase brand loyalty and directly inform potential consumers of new launches, with less chance of getting lost in a crowded newsfeed. Tareq Nazlawy shared his revelation regarding NFT communities, “As we advanced in the NFT drop project ['Into the Metaverse' Adidas drop], we realized that the actual NFT was a just tiny fraction of what we were getting ourselves into. The main part was building a membership community.” These communities can be quite popular—RTFKT hub has more than 208,000 Discord users, Adidas Originals has more than 59,000, and Gucci Vault has more than 57,000. Smaller communities like The Fabricant Studio, Prada Crypted, and Kenzo each have between 6,000 and 9,000 users.

CAUTIOUS OPTIMISM

While some brands have entered the metaverse without hesitation, others have exercised more caution, in part due to the technological unknowns. In March 2022, when Decentraland hosted the first Metaverse Fashion Week featuring Dolce & Gabbana, Estee Lauder, and Dundas, it recorded 108,000 unique attendees. Yet despite the high media coverage, attendees complained about
glitches, delays, and black screens. Beyond these technology errors, Metaverse Fashion Week also revealed the numerous technological limitations of avatar skins. Metaverse platforms require simplified graphics that take away from the design element of fashion, and with each platform having its own rules, the imagined interoperability of the metaverse, or the ability to transfer assets between different metaverse worlds, is still a far-off concept. As Joel Dietz, founding team member of Ethereum, points out, “Interoperability in the metaverse is a common and complex issue. Right now, all metaverses are different spaces that exist disconnected from each other” (See Interview Joel Dietz, page 68.) This means a digital shoe that can be worn in one virtual reality cannot necessarily be worn in others, a limitation that can be a deal-breaker for digital items that cost thousands of dollars and whose owners expect the highest usability possible. One of the first features Joel has introduced in his newest venture, Metaverse, is a metamap that enables the connection of different metaverses with a common way of addressing space.

Apart from technological limitations, there are also inherent business challenges to metaverse clothes, especially NFTs. Brands that highlight the exclusivity of NFTs must also limit their number and thus their revenue. The optimal release volume isn’t always clear. During one of its first NFT drops, Adidas released 30,000 NFT shoes. That number is high for NFTs (Prada launched 100 NFTs in its first drop), but it is small for a brand that produced 340 million pairs of physical shoes in 2021. The requirement to set up a cryptocurrency wallet to purchase an NFT can also be a deterrent for some buyers. DRESSX Chief Sustainability Officer Olga Chernysheva explains that, “We need to educate consumers on concepts such as crypto wallets and cryptocurrencies before they decide to buy an NFT. This [crypto wallet issue] makes the barrier to an NFT purchase higher—at least for those who are new to the metaverse.” The volatility of cryptocurrency values has also spilled over to NFTs, which could discourage NFT buyers who purchase them for investment.

Moreover, some of the metaverse momentum stems from the COVID-19 pandemic, during which time many fashion events were canceled. After the cancellation of the 2020 Men’s Fashion Week, typically held physically during June and July in London, Paris, and Milan, about a dozen brands decided to showcase their designs online using a combination of digital gatherings, videos, and presentations. Users did not approve—Tribe Dynamics and Launchmetrics estimated there was a 55% drop in engagement when fashion week shows first went online.

However, as the year went on, digital fashion shows grew more creative and appealing. In December 2020, Balenciaga presented its Fall 2021 collection in the original video game “Afterworld: The Age of Tomorrow.” Anyone could access the game through the company’s website, and journalists received Oculus VR headsets to see the designs more clearly. While most brands returned to the physical runway in 2021, the positive media response to Balenciaga’s digital release showed the fashion world how online events can exist as successful alternatives or perhaps even enhancements to physical ones.

Once skeptical fashion leaders have now made the
leap to digital. In a 2021 interview with Vogue Business, Chanel’s President Bruno Pavlovsky stated that, “Chanel will never be the first one. Metaverse is a revolution in the digital world. The day we are ready, we’ll probably come with our own contribution.” That “Chanel contribution” proved to be Le Bal de Paris, an hour-long virtual experience launched in May 2022 at London’s Barbican Centre, with VR technology and two live performers onsite. Chanel sponsored the event as well as designed the virtual costumes and online attendees were able to join in the story by wearing headsets and body-tracking sensors. The performance received the Lion award for Best VR Experience at the 78th Venice International Film Festival, emphasizing Chanel’s focus on excellence and quality.

Vogue writer Hetty Mahlich described the experience this way: “I go for a long white column dress with a black dropped-waist band. As a brand well out of my budget, wearing Chanel, albeit in digital form, is an experience in itself. When I look down, I can see the dress ripple as I twirl my hips. Around me, I see my companions, dressed up and transformed. We all look noticeably more elegant than we do in reality…I can only describe it as like being inside a video game, where you can be someone, or something, you may not be in real life.”
DRESSX sells clothes that people cannot wear. How did you come up with this idea? Daria and Natalia, the founders of DRESSX, started by selling traditional clothing. They had a booth at Paris Fashion Week 2018 where they were selling apparel by Ukrainian designers. They noticed that many consumers would return an item days after buying it. Those consumers likely never planned on wearing the clothes—they wanted to take pictures in them for social media!

What did Daria and Natalia do with that observation? They went to Beverly Hills in Los Angeles—the center of social media fashion. In their new pop-up store, clothes were never sold. Instead, consumers could try on clothes and take photos in the designated spaces. Rather than paying for clothes, consumers paid for the possibility to take pictures in them. These shops worked very well. DRESSX is currently working on a solution that would enable the digital item to be worn on several photos, but right now it is one look, one order.

And then came COVID? Exactly. With COVID, in-person pop-up stores were no longer an option. That’s how Daria and Natalia created DRESSX—an online service for content creators. You can go on the DRESSX website and select a digital garment you like. Before making the payment, you attach a photo of yourself on the website. The final product is your photo, but dressed in that garment. The result is amazing—it looks like you are wearing the digital piece of clothing in real life.

How is this form of digital fashion a better alternative to buying a “real” clothing item?
We did this because the fashion industry is one of the most polluting worldwide. Its carbon emissions result from multiple steps in the supply chain—from fabric creation to marketing campaigns. Moreover, a massive amount of water is used throughout the process. Finally, many clothes end on the landfill, leading to a waste of resources. Digital fashion offers the potential to eliminate material waste and limit carbon emissions.

Who is currently buying digital fashion? Some of our consumers are social media content creators who post on platforms like TikTok or Instagram. They use our app even daily. However, this is not our only consumer group. Surprisingly, DRESSX has also been popular with people aged 30 to 40. They initially try virtual clothes out of interest. They like it so much that they keep returning. This is because the result is cool, and the experience is fun and new.

Apart from photo edits, you also offer NFTs. Could you tell us a bit more about that? Our NFT marketplace is for those who want to wear digital fashion in more than one way. NFT items can be worn through AR technology on our app, on metaverse platforms like Decentraland, or even as game skins. The last two uses apply to selected NFTs. This way, we show the gamers and “crypto people” that they can use their NFTs instead of just holding them in a crypto wallet.

How would you compare the market for digital fashion (photo edits and AR) to the fashion NFT market? Digital fashion is easier to understand and use. In contrast, we need to educate consumers on concepts such as crypto wallets and cryptocurrencies before they decide to buy an NFT. This makes the barrier to an NFT purchase higher—at least for those who are new to the metaverse.

Once purchased, how are fashion NFTs typically used? Many use them purely as investment instruments. DRESSX wants to change that. We are encouraging everyone to have a personal metacloset—a collection of digital fashion items. About to join a video call? Go to the metacloset to choose a virtual item to wear. Playing a video game with your friends? Go to the metacloset to dress your avatar. Want to publish a photo on Instagram? Go to the metacloset and wear a digital filter for the most eye-catching effect.

How about “phygital” NFTs, have you tried them? Yes! We approached this creatively, with sustainability objectives in mind. We collaborated with a designer who makes clothes from 100% natural materials that can be decomposed even at home. He designed a necklace and dress made of dried moss. The pieces have not been produced yet; they will be custom-made for a person who buys the corresponding NFT. The owner will also be able to try on the digital pieces with the DRESSX AR app.
Apart from sustainability, DRESSX features collections on important causes such as supporting Ukraine. How important is a good cause to your customers? With Ukraine, the whole world was shocked by what was happening. We gathered designers who wanted to donate their artwork as an NFT to support the cause. Some designers have already worked with us, others volunteered when they heard about the initiative. This shows how supportive the community is.

What do you think is the future of digital fashion? I think the future is bright. When we started DRESSX, no one knew about digital fashion, and everyone thought we were crazy for selling “just air” for $30. Today, big brands like Adidas or Gucci sell digital fashion. We are sure that in the next few years every brand will follow. DRESSX estimates that the market for digital fashion will reach $31 billion per year in three to five years from now.

To what extent do you believe that digital fashion can replace traditional fashion? Barclays bank conducted a survey and found that around 9% of their credit card holders buy clothes only for content creation. If this is the case, our hope of fully replacing all those physical purchases with digital garments seems quite feasible. Doing that would save the same carbon footprint as that of Denmark.

How can companies cover the sustainability issue when entering the metaverse? They should use a combination of methods. First, track the supply chain. There are blockchain solutions that trace products from the raw materials to the customer.

Second, reduce the energy and materials in your physical goods. With digital design, you can eliminate the sampling and decrease the time needed to create things.

Third, think about purely digital marketing campaigns. Instead of creating clothes physically and sending them around the world to influencers who will wear them once, do it digitally. We have worked with Farfetch to show that purely digital marketing campaigns can be very successful.

Fourth, look into production on demand, where you can offer digital try-ons through AR or put digital mirrors in your shops. Stop producing new collections every season. Use digital methods to create more sustainable, durable goods.

This strategy is not only more environmentally sustainable but more profitable. Companies can save a lot of money by not overusing resources while driving sales through digital clothing.
DEEP DIVE

SURVEY CONDUCTED BY DRESSX PROVIDES INSIGHT ON CUSTOMERS OF DIGITAL FASHION

DIGITAL CONSUMERS TRY DIGITAL FASHION OUT OF CURiosity, BUT MANY ENJOY THE EXPERIENCE AND BECOME REPETITIVE BUYERS

What attracts users to digital fashion? [% of respondents]

<table>
<thead>
<tr>
<th>Attraction</th>
<th>% of Respondents</th>
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<tbody>
<tr>
<td>Curiosity</td>
<td>36%</td>
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<tr>
<td>Content creation</td>
<td>28%</td>
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<tr>
<td>Investment</td>
<td>13%</td>
</tr>
<tr>
<td>Sustainability</td>
<td>13%</td>
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<tr>
<td>Skins for games</td>
<td>9%</td>
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<td>Affordability</td>
<td>1%</td>
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What did you think about your experience buying a digital garment? [% of respondents]

<table>
<thead>
<tr>
<th>Opinion</th>
<th>% of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Love the idea, will come back for more</td>
<td>72%</td>
</tr>
<tr>
<td>Innovating and interesting, but as a one-time experience</td>
<td>17%</td>
</tr>
<tr>
<td>I don't get it at all</td>
<td>2%</td>
</tr>
<tr>
<td>Other</td>
<td>9%</td>
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DIGITAL CONSUMERS BELIEVE THAT DIGITAL FASHION COULD REPLACE REAL CLOTHES FOR CONTENT CREATION, BUT IT DOES NOT TRANSLATE INTO FEWER PURCHASES OF PHYSICAL GARMENTS

Would you say that digital garments could replace real clothes for content creation? [% of respondents]

<table>
<thead>
<tr>
<th>Opinion</th>
<th>% of Respondents</th>
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</thead>
<tbody>
<tr>
<td>Definitely yes</td>
<td>35%</td>
</tr>
<tr>
<td>Probably yes</td>
<td>19%</td>
</tr>
<tr>
<td>Might or might not</td>
<td>21%</td>
</tr>
<tr>
<td>Probably not</td>
<td>17%</td>
</tr>
<tr>
<td>Definitely not</td>
<td>8%</td>
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</tbody>
</table>

Do you think that since you started to buy digital garments, you have bought less physical garments? [% of respondents]

<table>
<thead>
<tr>
<th>Opinion</th>
<th>% of Respondents</th>
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<tbody>
<tr>
<td>Definitely yes</td>
<td>3%</td>
</tr>
<tr>
<td>Probably yes</td>
<td>10%</td>
</tr>
<tr>
<td>Might or might not</td>
<td>23%</td>
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<tr>
<td>Probably not</td>
<td>25%</td>
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<tr>
<td>Definitely not</td>
<td>39%</td>
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</tbody>
</table>

Source: survey with 250 respondents conducted in July and August 2022 by DRESSX; BCG analysis
<table>
<thead>
<tr>
<th>Ecosystem Map</th>
<th>Products</th>
<th>Players</th>
<th>Space</th>
<th>Technology</th>
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</thead>
<tbody>
<tr>
<td>NFTs</td>
<td>Digital Fashion</td>
<td>Video Game Skins</td>
<td>Metaverse Platforms</td>
<td>Social Media Platforms</td>
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<td>Digital native creators</td>
<td>Fashion brands</td>
<td>Web3 investors</td>
<td>Marketplaces</td>
<td>Video social games</td>
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<td>Dappl</td>
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<td>Instagram</td>
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<td>Puma</td>
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<td>DRESSX</td>
<td>BURBERRY</td>
<td>SOUND</td>
<td>Decentraland</td>
<td>ZEPETO</td>
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<tr>
<td>TRIBUTE BRAND</td>
<td>D&amp;G</td>
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<td>AnimalCrossing</td>
<td>Worlds</td>
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<td>MAGMA BURRIN</td>
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<td>TOMMY HILFIGER</td>
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As Chapter 2 revealed, increasingly more fashion companies are testing opportunities in the metaverse. Attractive demographics and the opportunity to take customer relationships to a new level of engagement are significant drivers, and we predict that by 2030 most industry leaders will have established a presence in the metaverse. In Chapter 3, we analyze how moving into the metaverse could translate into extra revenues while also evaluating the effect on the sustainability goals of the fashion industry.

Based on BCG’s proprietary modeling, customer research, and interview insights, we estimate that in the base case scenario, fashion in the metaverse could generate sales of up to $25 billion a year in 2030. Although this revenue might seem significant, it offers just a 1% to 2% upside compared to retail sales of $1.7 trillion that the fashion industry currently generates. In the bull scenario, we forecast that these revenues could be $50 billion overall, a wide range of estimation resulting from the high market volatility and different assumptions regarding adoption rates. In the base case scenario, $6 billion would come from video game skins, $6 billion from digital fashion, and $13 billion from NFTs. We assume that this extra revenue would
As showcased in Chapter 2, fashion companies are increasingly experimenting with the metaverse. One-third of the 120 leading global fashion companies we analyzed experimented in the metaverse over the last two years—discovering, learning, and earning tangible revenues in the process. We predict this fashion trend will continue, with most industry leaders establishing a metaverse presence by 2030.

In the metaverse, fashion brands have the opportunity to connect with an array of customers and engage with fans in new ways. This could lead to increased revenue and brand loyalty. However, it’s important to consider the environmental impact of the metaverse and how it can be made more sustainable.

To evaluate the impact of fashion in the metaverse on the CO2e emissions of the fashion industry, we consider three scenarios.

Scenario 1, a high-carbon metaverse, reveals that CO2 emissions of the fashion industry could go up by between 0.6% and 1.2%, mostly driven by the heavy environmental footprint of NFTs minted on blockchains using proof-of-work consensus mechanism. Scenario 2, a light-carbon metaverse, assumes that the blockchain technology becomes more sustainable by switching to energy-efficient solutions such as proof-of-stake consensus mechanism. In this scenario, digital fashion could be neutral for the sustainability of the fashion industry, generating an insignificant 0.1% increase in CO2 emissions.

Scenario 3, a metaverse as a force for good, outlines the opportunities that new digital technologies and tools create, which could help fashion companies to lessen excess inventories and overproduction, improve operating margins, and reduce CO2 emissions. These opportunities are extensive and exciting. Innovations in product development, such as digital twin technology and 3D design, could help cut down on physical samples by as much as 70% and shorten time to market by 40%. Transparent traceability of the supply chain would be vital to reducing Scope 3 emissions. Virtual showrooms and 3D try-ons may translate into a lower number of returns. Overall, we estimate that for every 1% reduction in overproduction that the end-to-end digital transformation could result in, the CO2e emissions of the fashion industry would decline by between 0.2% and 0.4%.
demographics, including consumers who might not otherwise seek out the brand. Gen Z and Gen Alpha are increasingly engaging with proto-metaverse platforms, playing online video games, socializing, and making purchases. The average age of a Roblox player is between 9 and 12. In the gaming world, fashion companies can meet Gen Z and Gen Alpha in their natural habitat, building brand awareness to capitalize on as gamers grow older and expand their purchasing power.

The metaverse allows the fashion industry to build brand recognition with the next generation of consumers, but what about the consumers of today who already have brand preferences? Consumers loyal to a brand are often willing to pay a premium to own that brand’s merchandise, and, with luxury brands, this premium can be considerable. The metaverse is a natural next storefront for luxury brands as there is considerable wealth concentrated in cryptocurrencies—at the time of writing, the market capitalization of Ethereum is $210 billion, even following 65% price decline since its peak in November 2021. NFTs are of special interest to some cryptocurrency holders seeking to capitalize on metaverse investment opportunities, with 80% of the NFT market value held by just 10% of all NFT owners. But NFTs are more than just an investment asset: they offer access and a sense of community, the ownership of unique and scarce goods, and a way to demonstrate brand recognition and preference. The ability to record NFT ownership and verify NFT authenticity—made possible by Web3 and blockchain technology—is a significant opportunity for luxury brands whose premium pricing relies in part on the exclusivity and authenticity of items. NFTs are also being increasingly used by celebrities - Snoop Dogg and Eminem performed as Bored Apes NFTs at MTV Awards. There examples of NFTs launched by academic institutions – for example, INSEAD’s Savvy Salamander Study Club (SSSC), with 100% of net NFT sales going towards scholarships.

The metaverse market is growing, and so is the potential for businesses that are bold enough to enter it. However, considering the costs and the benefits is essential when making any significant change based on opportunity. In Chapter 3, we present the results from our proprietary modeling that estimates what impact the metaverse could have on sales and the fashion industry’s sustainability goals. We also discuss the results of survey research we conducted to validate selected assumptions for our model.

**MONETIZING THE METAVERSE**

To the general audience, the metaverse still sounds like an abstract notion. From our interviews, it was clear that most respondents, even teenagers, were not enthusiastic but instead skeptical of the metaverse. David, a teenager interviewed from Taiwan, expressed, “I think the concept of virtual reality will influence many aspects of life. It can be more convenient to join a meeting online, but at the same time it can make people lazier. Moreover, the social aspects would be worse. I still think that in-person interactions are very important and better.” However, we see the metaverse not as a revolution but as a gradual evolution of the internet we know today. Just as the internet, mobile, and social media made unannounced entry into our lives and became a dominant portion of our time, we may all soon
have digital lives in the metaverse. Our survey results indicated that, while there is hesitation toward the idea of the metaverse, socializing online is already embedded in our everyday lives. In the past 12 months, 86% of digital users socialized with friends online, 63% attended an online event, and 40% played online video games (e.g., Roblox, Fortnite, LoL, Call of Duty).

As our digital lives evolve, so too will our need to address our digital appearance. While just 4% of our survey respondents felt digital appearance was more important than their physical appearance, we predict it will be more in the future, especially if international markets are an indicator. Of our respondents, 45% digital users in Asia and 25% outside of Asia claimed that digital appearance is equally as important as their physical appearance. Gulay, a teenager from Turkey, shared: “I can imagine a situation in which it is more important what my avatar looks like than what I look like. If this happens, I can imagine my avatar purchases to replace ‘regular’ shopping.”

So, just how big is the opportunity for the fashion industry in the metaverse? While the market is still in its infancy today, we forecast that fashion in the metaverse could become a significant source of new revenue with the potential to add $25 billion a year in revenues by 2030, increasing fashion industry revenues by between 1% and 2% from the substantial base of $1 trillion in 2022. We see the highest monetization potential among the three use cases of social video game skins, digital fashion, and fashion NFTs.

Social video game skins. The market for video game skins is well-established with significant growth potential. Nearly 3.2 billion people worldwide play games, and estimates for video game spending are $196.8 billion. Virtual in-game items purchased, including video game skins, represent roughly $40 billion to $50 billion of this spending. According to the Global Head of Licensing at one of the most popular gaming metaverse platforms that we interviewed: “The video game skins market has never been healthier.” In addition to having strong market health, our interviews revealed that video game skins appeal to the teenage consumer. As explained by Emma from France, who often spends money on in-game purchases, “I want to buy the skin that I like. I want my avatar to have it because this way, when I’m playing the game, I can see something that I love. This way, I enjoy the game more.”

In Chapter 2, we shared examples of fashion companies that have pioneered launching branded video game skins, but their market share is currently marginal. In Fortnite, branded skins by Balenciaga, Nike, and Moncler currently represent less than 1% of all outfits available. In Roblox, the combined number of Gucci, Ralph Lauren, and Tommy Hilfiger items is less than 100, compared to hundreds of thousands of skins available in the shop. Moreover, due to the creative nature of this metaverse world and openness to players’ creations, there is an enormous number of counterfeits of luxury brand items, mirroring the real-life issues with non-original branded products. In the most popular multiplayer games, such as League of Legends, Honor of Kings, or Apex Legends, the market share of fashion brands is even smaller. Prices of most branded video game skins fall between $8 and $18, however; many skins require additional actions to be completed by players to acquire them, thus increasing their in-game value.
Licensed video game skins can generate sizeable revenues. In the example of Fortnite, we were able to get a glimpse into the profitability of some of its skin licenses from the numbers disclosed by its parent company, Epic Games, during its trial against Apple. Epic disclosed it sold 3.3 million NFL-branded skins at 1,500 V-bucks (the Fortnite in-game currency) apiece during their run in November and December—overall around $50 million from a single set of skins. Epic separately revealed a chart with its top collaborations with branded IPs without revealing numbers. The top three revenue generators were Marvel, Star Wars, and NFL. Nike was the ninth most profitable collaboration.

Fashion companies can join brands leading the way and tap into this lucrative market. In our survey, we asked gamers if they would be interested in purchasing video game skins from established fashion companies if such skins were available. Of respondents, 18% said they would be more likely to buy from established fashion players, 39% equally likely to buy, and 43% less likely to buy. We forecast that sales of branded video game skins could reach $6 billion in 2030, though most of this value will likely stay with gaming companies through revenue-sharing agreements. For fashion players, the appeal of branded skins lies in the potential benefits of brand perception, reaching new audiences, and capturing media attention, with revenues being just a small part of a larger vision. A head of licensing who we interviewed affirmed this sentiment, stating, "High fashion brands are not really concerned about the revenue their video game skins generate from various collaborations since it is such a small fraction of their revenues. What they do care about, however, are the second- and third-order effects such collaborations have on people buying those skins, as in the future they will be more willing to buy their high-end physical goods. This helps the Guccis and Louis Vuittons of this world to attract a customer base that has previously been unreachable."

Digital fashion. For our purposes of analysis, we consider digital fashion in its purest form: digital garments purchased as collectibles, photo overlays or AR/VR filters, and skins for avatars outside of the gaming environment such as in Decentraland. The market is still in the very early stages of development but growing dynamically. The Institute of Digital Fashion (IoDF), a startup founded in 2020, expects to increase its sales eight times this year, to £7 million up from £0.9 million in 2021, with expected sales of £23 million in 2023. Meanwhile, in April 2022, despite bear market, IoDF is expecting to close its seed funding round, and two other digital fashion houses raised capital this year: the Fabricant raised $14 million in a round of series A funding, while in July 2022, Tribute Brand raised $4.6 million in a seed round of funding. Among other important investments in Web3 fashion-oriented startups is the $56 million Series B funding for Ready Player Me, a platform enabling the creation of cross-game avatars for multiple metaverse worlds. We estimate that digital fashion sales could reach $6 billion a year in a base scenario and $12 billion a year in a bull scenario by 2030.

Fashion industry leaders stand a good chance to win market share in digital fashion against newer, digitally native brands. In our survey, just 16% of respondents said they would be likely to consider a digitally native competitor when purchasing a digital fashion item or a wearable
CHAPTER III

LUXURY AND SPORTSWEAR BRANDS ARE BEST-POSITIONED TO WIN CUSTOMERS IN APPAREL NFTs AND DIGITAL FASHION

If you were to buy an apparel NFT or digital fashion item, what brands would you be the most likely to consider? [Multiple answer question, each answer % is out of 100]

Source: consumer survey with over 2,800 respondents conducted in May 2022, BCG analysis

NFT. Established luxury brands and sportswear brands are top picks: 36% of respondents would consider luxury brands and 34% sportswear brands.

Fashion NFTs. In our model, we consider all NFTs issued by fashion companies regardless of form—thus, not only wearable NFTs, but also redeemables, fashion digital art, and others. The NFT market saw explosive expansion in 2021, as elaborated in Chapter 2, however, NFTs did not fair well in the bear market. As cryptocurrencies sank, the monthly trading volume of OpenSea, the largest NFT marketplace, fell roughly 85% in the first half of 2022. Despite the current NFT market downturn, we are confident in the long-term NFT market growth. Like with the dot.com bubble, we believe that as the NFT hype fades, it will give rise to a new era of builders laying strong foundations for long-term organic growth, based less on speculation and more on the potential community-building aspect and utilities of NFTs.

Based on our survey results, we see the potential for further dynamic market growth of fashion NFTs. In the past 12 months, 10% of digital users purchased NFTs, but when asked about the next 12 months, 29% expressed interest in buying NFTs, making them the most promising virtual asset class. Among the current NFT holders we surveyed, two-thirds bought NFTs for profit, while the other one-third bought NFTs for reasons of collectibles/fandom, belonging to a community, and scarcity/authenticity. Although the NFT market is rapidly evolving, it is still niche and can see even stronger growth by expanding to new demographic groups and new geographies. For example, in our survey, more than 70% of current NFT holders are men. However, among
those interested in buying NFTs in the next 12 months, the gender split is more balanced, with men representing 57% of all interested. If all women who expressed interest made a purchase, the number of female NFT holders could grow almost five times in 2023.

We see the biggest NFT market opportunities in categories with premium price tags, such as luxury and designer sportswear, where we can envision several significant use cases, including digital twin, proof of authenticity or token-gated access that Adidas has experimented with during its Into the Metaverse NFT drop. Sportswear and luxury are also two categories they would be the most likely to consider when purchasing fashion NFTs. If just 5% of luxury and premium sportswear products were sold via redeemable NFTs or with NFT-based proof of authenticity, we estimate that, in the base case, the total addressable market would surpass $13 billion a year by 2030 and, in a bull case, it would surpass $26 billion. This broad range is a result of high market volatility.
CONSUMER SURVEY RESULTS ON NFTs

STRONG NFT INTEREST EXISTS AMONG DIGITAL USERS

Have you ever purchased a virtual asset, or are you interested in purchasing one in the next 12 months? [% of all digital users who have purchased vs. who would consider purchasing a specific type of virtual asset in the next 12 months]

Digital art and collectibles are the most popular NFTs among holders

What types of NFTs do you own? [Multiple answer question, each answer % of respondents out of 100%]

Source: consumer survey with over 2,800 respondents conducted in May 2022, BCG analysis
INVESTMENT IS A PRIMARY REASON TO BUY NFTs FOR ALMOST 70% OF CURRENT NFT HOLDERS, FOLLOWED BY NOVELTY

What are your primary reasons for buying an NFT? [Multiple answer question, each answer % of respondents out of 100%]

- Profit/investment: 66%
- Novelty/early tech adopter: 50%
- Collectible: 31%
- Access and belonging to a community: 28%
- Authenticity/scarcity: 27%
- Digital appearance/profile picture: 20%
- Fandom: 17%
- Authentication/NFT corresponding to physical product: 17%
- Redeemable product/trade for physical product: 15%
- Redeemable experience: 14%
- Status/wealth: 11%
- Other: 4%

NFT MARKET COULD EXPAND SIGNIFICANTLY

Over 70% of current NFT holders are men, but there is strong interest in purchasing NFTs among women. High interest in NFT purchase across all geographies, especially in Asia and Europe.

Source: consumer survey with over 2,800 respondents conducted in May 2022, BCG analysis
CHAPTER III

THE CARBON PRICE TAG

Digital clothing can be a lucrative opportunity for fashion brands in the metaverse, but with this opportunity comes risk. The fashion industry currently accounts for 5% of CO2 emissions globally, and digital fashion, especially NFTs, carries its own carbon footprint via technology use. To understand the carbon footprint of metaverse fashion and whether the opportunity outweighs the threat from a sustainability standpoint, we analyze three fundamental questions:

• What technology allows for creating and trading fashion in the metaverse, and how will it evolve?
• Can digital fashion replace a portion of physical production, or is it complementary?
• Can digital technologies help fashion companies reduce traditional business CO2 emissions?

WHY THE TECHNOLOGY MATTERS

The technology used to create and trade digital fashion in the metaverse matters when it comes to sustainability. To provide perspective, a pair of Levi’s jeans produces the equivalent of 33.4 kg of carbon dioxide across its entire lifespan, from production of fiber and fabric assembly, via production, packaging, logistics, and retail, to consumer care and to final disposal in a landfill; a cotton T-shirt produces 6.5 kg of CO2e across its lifespan. For digital fashion, the CO2e emissions for a basic T-shirt are estimated at 0.25 kg of CO2e, while a complex couture look can result in 2.5 kg of CO2e depending on how much time is spent on electronic devices to create and

THANKS TO THE CHANGE OF CONSENSUS MECHANISM, THE STAGGERING CARBON FOOTPRINT OF NFTS MINTED ON ETHEREUM WAS REDUCED BY OVER 99%

[Carbon emissions per unit]

Sources: Carbon.fyi; DRESSX; Levi’s; BCG analysis.
then dress a customer in the digital clothing. However, if an item is minted as NFT on a blockchain using the proof-of-work consensus mechanism, its carbon footprint rose on average to a disquieting 248 kg of CO2e, measured from minting until the last known transaction was recorded on the blockchain, with the potential for more emissions every time the NFT is traded and a new transaction is recorded on the blockchain. According to our analysis of the largest NFT drops thus far, the secondary trading volume is highest in the first weeks or months following the drop, on average reaching 40% of the primary volume.

NFTs are powered by blockchain, making blockchain sustainability central to understanding the environmental impact of metaverse fashion. Ethereum is the blockchain predominantly used by NFT creators, with around 80% of NFTs currently minted on Ethereum blockchain. Until recently, Ethereum had been using the energy-intensive proof-of-work authentication protocol that generated incredibly high carbon footprints. The Ethereum network consumed around 84 TWh of electricity each year, comparable to the consumption of a medium-sized country such as Finland. NFTs have often been criticized as being wasteful and harmful to the environment due to these emissions, making it vital to address blockchain sustainability issues before NFTs experience exponential growth. Fortunately, mitigation opportunities exist and blockchain does not need to sacrifice sustainability.

The most notable blockchain sustainability solution occurred in September 2022 with the Ethereum Merge and the birth of Ethereum 2.0. “The Merge” transformed the Ethereum consensus mechanism from proof-of-work to proof-of-stake, which uses significantly less energy. Ethereum has promised to cut the network’s energy consumption by more than 99% with the Merge and has positioned itself as a green alternative for crypto users. Although other green blockchains already exist, such as Solana, a blockchain that uses less energy than two Google searches and accounts for roughly 10% of NFTs trading volume, Ethereum remains the most popular network. The strength of Ethereum is a result of it being the first network to enable smart contracts, having the largest NFT marketplaces such as OpenSea based on it, and possessing the broadest network of buyers. There are 1.5 million wallets holding at least one coin, and more than 45,000 addresses holding more than 100 coins.

Sustainability of the blockchain-based currencies proved also to be an important point for major investors. In January 2021, Tesla bought $1.5 billion of the cryptocurrency Bitcoin and in March made it a valid payment method to buy its cars. However, just two months later, the company’s CEO announced it would no longer accept vehicle purchases using the cryptocurrency, citing environmental concerns: “We are concerned about rapidly increasing use of fossil fuels for Bitcoin mining and transactions, especially coal, which has the worst emissions of any fuel” and pointing out that “Cryptocurrency is a good idea...but this cannot come at great cost to the environment.” Tesla sold most of its Bitcoin holding in July 2022 with a multimillion loss on the investment.
THE BLOCKCHAIN PROBLEM
When speaking about metaverse, Web 3.0, and sustainability, it is essential to understand the underlying blockchain technology and concerns regarding its energy consumption. Let us first define several terms fundamental to our discussion,

Cryptocurrency, A digital asset and form of currency resembling traits such as store of value, medium of exchange, or unit of account and maintained by a decentralized system using blockchains such as Bitcoin, Ethereum, or Solana.

Blockchain, A digitally-distributed, decentralized, peer-to-peer, immutable, and irrefutable network that facilitates the process of recording transactions.

Consensus Mechanism, The algorithm used to determine the validity of a new transaction before adding a new block to the chain, that awards network participants for exerting the effort required for such validation.

Layer 2, A network or service built on top of an existing blockchain network that is set up to improve, facilitate, or expand the features of the underlying first layer.

The energy usage of blockchain technology is driven mainly by the transaction validation process for which there are two main consensus mechanisms: proof-of-work and proof-of-stake. The two consensus mechanisms differ is their underlying algorithm. Proof-of-work relies on complex computations referred to as mining that require high energy consumption to solve, whereas proof-of-stake relies on individual participants selected to verify transactions and add blocks to the ledger in proportion to their stake in the network. Which mechanism is better from a decentralization perspective is a topic of heated discussion in the blockchain community, but the validity of the use of either mechanism is dependent on cost-benefit analysis.

In the NFT and metaverse space, the proof-of-stake mechanism is considered to be a better solution as it allows for a significantly higher transaction throughput. What has been remarkable, however, is that Ethereum, the largest blockchain allowing for NFT minting and transaction, relied on the proof-of-work mechanism until recently. In September 2022, the founder and core developers of Ethereum blockchain introduced the Merge, which effectively updated the consensus mechanism that Ethereum relies on to be proof-of-stake. This shift from proof-of-work to proof-of-stake was a move that took considerable time to accomplish. Layer 1 of Ethereum, known as the Mainnet, was initially paired with a consensus layer that relied on proof-of-work mechanism. Over the last years, a parallel consensus layer was developed, known as the Beacon Chain, that is based on proof-of-stake mechanism. During the Merge, the Beacon Chain merged with the Mainnet, taking over the consensus engine role and permanently replacing the energy-intensive use of proof-of-work. The Merge is a significant move toward sustainability with Ethereum’s throughput raised from around 10 transactions per second to up to 100,000 transactions per second.
Other chains also support second layers for improving the transactions per second. For example, the core Bitcoin blockchain has been extended with the Lightning Network, an off-chain solution that allows for instant transaction settlement due to liquidity provided by the users. This solution requires only the final transaction to be settled on the main Bitcoin layer—similarly to how banks settle balances among one another—while other transactions are settled within the liquidity pool. This technology decreases the number of transactions that need to be sent through the network, significantly reducing the strain on Bitcoin blockchain and contributing to a lower carbon footprint of the proof-of-work validation mechanism. Additional Layer 2 or Layer 3 solutions could be implemented on proof-of-work chains to improve the throughput and versatility while leaving the baseline premises of Layer 1 intact.

Although the energy consumption of the proof-of-work system is undeniable, what is worth noting is that around 40% of proof-of-work consensus electricity use comes from renewable sources. The proof-of-work consumption figure is also skewed in the way that it shows the usage of electricity that would have otherwise not been consumed—mining equipment is turned on during periods of less energy demand in the grid which actually helps to regulate the energy inefficiencies of power plants.

It is worth noting that some cryptocurrency projects have aimed to solve the consensus mechanism debate by introducing alternative transaction settlement options. For example, Solana relies on a proof-of-history mechanism that utilizes a chronological, time-stamped cryptographic function validators can verify by checking the correct sequence of blocks without solving complex computation functions or requiring staking own capital.

While it is unlikely that a general consensus will be reached in the consensus mechanism debate, it is important to understand that each solution comes with costs as well as benefits, and it is essentially down to the user to choose which network they would like to engage with.
METAVERSE FASHION: CO2 GENERATOR, REDUCER, OR FORCE FOR GOOD

We analyze three scenarios to estimate the impact of fashion in the metaverse on the CO2e emissions of the fashion industry. In Scenario 1, we forecast what CO2 emissions virtual fashion could generate on top of the current CO2 emissions of the fashion industry, assuming that currently dominant technologies, such as proof-of-work consensus mechanism, are used. In Scenario 2, we evaluate how this impact could be reduced if blockchain sustainability issues are addressed. In Scenario 3, we explore opportunities for how new digital technologies that power the metaverse could help transform the traditional fashion industry and reduce overproduction.

THE IMPACT OF METAVERSE FASHION ON THE INDUSTRY’S CO2 EMISSIONS: A LOOK AT THREE SCENARIOS

1. HIGH CARBON METAVERSE

The digital fashion and fashion market grow dynamically using energy-intensive technologies such as proof-of-work blockchain

+0.6% to 1.2% extra CO2 emissions in 2030

2. LIGHT CARBON METAVERSE

Blockchain sustainability is addressed via the move to proof-of-stake consensus mechanism and other sustainable technologies

Up to + 0.1% extra CO2 emissions in 2030

3. METAVERSE AS A FORCE FOR GOOD

Scenario 2 applies, and the metaverse helps reduce emissions by substituting some excess consumption and reducing overproduction

0.2% to 0.4% less CO2 emissions for every 1% reduction in overproduction

1. HIGH CARBON METAVERSE SCENARIO: If fashion’s growth in the metaverse is powered by proof-of-work consensus mechanism, there is a risk that CO2e emissions of the fashion industry could grow additionally by between 0.6% to 1.2% by 2030

To estimate the incremental carbon footprint of fashion in the metaverse, we focus on the three most popular use cases with the highest growth potential: video game skins, digital fashion, and
NFTs. We estimate that by 2030, fashion in the metaverse could generate emissions equivalent to between 17 Mn tonnes and 34 Mn tonnes of CO2. To put this figure into perspective, the annual CO2e emissions of Sweden are currently at 35 Mn tonnes of CO2e. Such incremental CO2 emissions would increase the fashion industry’s carbon footprint by 0.6% to 1.2%, a percentage that may seem small but only because we compare it to the disquietingly high emissions that the fashion industry currently generates.

From our calculations, 85% to 90% of the emissions that metaverse fashion could generate would be fueled by NFTs. That is why addressing the blockchain sustainability issue before NFTs experience another period of exponential growth is crucial.

SENSITIVITY ANALYSIS OF THE ENERGY MIX

The amount of CO2 emissions generated by the fashion industry and its metaverse presence is largely fueled by the energy mix. Technologies applied to generate power are used both to create physical clothes and to produce fashion NFTs, influencing industry impact on the environment and playing a crucial role in industry greening.

Our model assumes that the energy mix in 2030 might influence CO2 emissions, depending on three scenarios proposed by the IEA in its World Energy Outlook 2021.80

- The “Net Zero Emissions by 2050 Scenario” (NZE), under which the global energy sector achieves net zero CO2 emissions by 2050, with advanced economies reaching net zero emissions in advance of others. This scenario also meets key energy-related UN Sustainable Development Goals, in particular achieving universal energy access by 2030. The NZE does not rely on emissions reductions from outside the energy sector to achieve its goals, but assumes that nonenergy emissions will be reduced in the same proportion as energy emissions. It is consistent with limiting the global temperature rise to 1.5°C without a temperature overshoot (with a 50% probability).
- The “Announced Pledges Scenario” (APS), which takes account of all climate commitments made by governments around the world, including Nationally Determined Contributions as well as longer term net-zero targets, assumes that they will be met in-full and on-time as its baseline. The global trends in this scenario represent the cumulative extent of the world’s ambition to tackle climate change as of mid-2021. The remaining difference in global emissions between the APS and the goals in the NZE or the Sustainable Development Scenario shows the “ambition gap” that needs to be closed to achieve the goals agreed upon in the 2015 Paris Agreement.
- The “Stated Policies Scenario” (STEPS) does not take for granted that governments
will reach all announced goals. Instead, STEPS explores where the energy system might go without additional policy implementation. As with the APS, it is not designed to achieve a particular outcome. It takes a granular, sector-by-sector look at existing policies and measures as well as those under development. The remaining difference in global emissions between the STEPS and the APS represents the “implementation gap” that needs to be closed for countries to achieve their announced decarbonization targets.

Under each scenario we assume, to a different extent, deployment of renewables and nuclear power against coal, oil, and natural gas.

Another assumption relating to our model is the geographical setting for physical and digital fashion:

- Physical fashion production could be considered local in the sense that the majority of worldwide textiles are produced in Asia, with China and India as the leaders. Even with increased nearshoring production to Europe, the potential impact is considered immaterial due to the difficulty of infrastructure relocation by 2030 in terms of factories, warehouses, and workforce rooted in Asia-Pacific countries. Therefore, we assume the APS scenario for Asia Pacific as a baseline for physical production, where 2030 CO2e emissions would be 6% higher than under the energy mix today.

- Fashion NFTs minting, on the other hand, could be considered global when it comes to the energy mix. NFT ownership rights are recorded on blockchain technology built on cryptocurrencies mined worldwide in countries with the highest hash rate. Mining hash rate is a measure of the computing power on a cryptocurrency network that serves as a security key. The more hashing, or computing, power in the network, the greater its security and its overall resistance to attack. Up until September 2021, the largest bitcoin producer was China. When it banned cryptocurrency, the global hash rate and the Bitcoin mining map shifted significantly, with the US as the new leader. Other factors that determine the location of cryptocurrency mining are energy prices and regulatory constraints, both of which are highly volatile. Hence, we conservatively assume the APS scenario for the whole world as a baseline for digital fashion production, where 2030 CO2e emissions would be 1.5% lower than under the energy mix today.

The CO2e emissions would differ substantially depending on the level of policy adoption announced. We estimate that by 2030, fashion in the metaverse could generate from 21 Mn tonnes of CO2e under the NZE scenario up to 37 Mn tonnes of CO2e under the STEPS scenario—almost 80% more.
LOW CARBON METAVERSE SCENARIO: If blockchain sustainability issues are resolved, fashion in the metaverse could increase CO2 emissions marginally by up to 0.1%, which would be close to neutral for fashion industry sustainability targets.

Now that the Ethereum Merge is complete, the fashion industry can use mostly proof-of-stake or second-layer blockchain networks for its NFT drops, with the potential to substantially reduce the emissions of metaverse fashion to an estimated 2 Mn tonnes of CO2. Such emissions would not pose a significant threat to fashion industry sustainability targets. To put this number into perspective, an average American consumer buys 53 new articles of clothing per year. If the entire population of the US, around 330 million citizens, purchased an average of one T-shirt less—a mere 1.9% of their yearly purchase—the CO2 savings would be sufficient to cover the 2 Mn tonnes generated by metaverse fashion in Scenario 2. On a more ambitious scale, if the whole world population, almost 8 billion people, would do the same, it would reduce worldwide fashion industry emissions by 2.3% or 52 Mn tonnes of CO2, comparable to the annual carbon footprint of Peru.

METAVERSE AS A FORCE FOR GOOD SCENARIO: A look at how digital fashion in the metaverse could become an opportunity for fashion industry sustainability by reducing the carbon footprint of traditional businesses.

While some argue that metaverse fashion will be incremental to physical fashion production, digital fashion enthusiasts believe it could be a disruptive force, helping the industry to reduce excess production and waste. When considering the metaverse as a force for good scenario, two fundamental questions must be carefully evaluated to determine the sustainability costs and benefits: Can digital fashion replace a portion of physical production? Can digital technologies help fashion companies reduce traditional business CO2 emissions?

Digital purchases could partially replace physical ones, especially purchases made solely for digital content creation. For example, posts on Instagram or TikTok could potentially be replaced by digital fashion. Of our survey one-third digital users indicated digital appearance is of equal or more importance than physical appearance. In the future, we can imagine a world where the digital-native generation will choose to spend some of its disposable income on digital rather than physical fashion. While consumers will obviously always need physical clothes, fashion is so much more than outfits that people wear. It fulfills a variety of needs, such as self-expression, a sense of newness and novelty, owning a unique branded product, or demonstrating wealth or status. Some of these needs can be met by digital fashion, as we heard from early adopters of digital fashion.
CHAPTER III

DIGITAL FASHION FULFILLS A VARIETY OF NEEDS FOR THOSE WHO ALREADY BUY IT

What are your primary reasons for buying digital fashion items? [Multiple answer question, each answer % is out of 100]

<table>
<thead>
<tr>
<th>Reason</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>Way to express yourself</td>
<td>55%</td>
</tr>
<tr>
<td>Novelty/fashion</td>
<td>45%</td>
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<tr>
<td>Digital appearance/social media content</td>
<td>33%</td>
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<tr>
<td>Designer/brand</td>
<td>30%</td>
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<tr>
<td>Redeemable experience</td>
<td>28%</td>
</tr>
<tr>
<td>Redeemable product</td>
<td>22%</td>
</tr>
<tr>
<td>Access and belonging to community</td>
<td>21%</td>
</tr>
<tr>
<td>Status/wealth</td>
<td>21%</td>
</tr>
<tr>
<td>Authentication/proof of ownership</td>
<td>19%</td>
</tr>
<tr>
<td>Sustainability</td>
<td>19%</td>
</tr>
<tr>
<td>Authenticity/secrecy</td>
<td>18%</td>
</tr>
<tr>
<td>Other</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: consumer survey with over 2,800 respondents conducted in May 2022, BCG analysis

The rise of Instagram and TikTok has created a “snap and send back” phenomena where influencers purchase clothing to produce social media content and then often return these items to the store. In our survey, 15% of digital users overall and 21% of those aged 18 to 25 said they occasionally buy clothes to create social media posts. Fashion hauls, where a creator reviews a pile of clothing to an audience online, first emerged in the early 2000s on YouTube and gained popularity during COVID across social media platforms. The #haul hashtag has 25.5 billion views on TikTok and has been used in 2.7 million Instagram posts and 350,000 YouTube videos. Unboxing is yet another concept featuring creators unpacking and showing a newly purchased product online. Originally a YouTube phenomenon in the gaming and electronics sphere dating back to the early 2000s, today it's been adopted by a new generation of digital creators, with #unboxing hashtag used in 3.4 million Instagram posts and 45.5 billion views on TikTok. Digital fashion could be a healthy alternative to such behaviors and contribute to waste reduction. As we heard from founders of digital fashion startups such as DRESSX or Tribute Brand, observing this very phenomenon gave them the idea to provide consumers with digital alternatives.

There is no consensus to what extent digital fashion could replace physical fashion, even among digital fashion enthusiasts and early adopters. DRESSX believes that digital fashion could help save the planet by reducing physical fashion production by even 1%, fully substituting clothes purchased for the production of digital content, and it measures itself against this sustainability target. “Barclay’s bank conducted a survey and found that around 9% of their credit card holders
buy clothes only for content creation. If this is the case, our hope—of fully replacing all those physical purchases with digital garments—seems quite feasible,” shared Olga Chernysheva, Head of Sustainability at DRESSX, in the interview for this report. On the other hand, Alexandra, an early digital fashion adopter we interviewed, shared with us: “I don’t think people are going to buy digital fashion instead of physical fashion. It’s something entirely different.”

Most of our survey respondents are skeptical of digital fashion, with 75% of digital users disagreeing that digital garments can replace the need for physical fashion. Respondents who already purchase digital fashion exhibit a stronger belief that digital apparel can replace physical garments, but they currently represent too small a niche to significantly move the needle for the whole fashion industry. Additionally, based on the interviews we conducted, we see that large corporates would welcome digital fashion as an additional revenue stream rather than a substitute for traditional products that are their bread-and-butter.
MOST DIGITAL USERS ARE SKEPTICAL OF DIGITAL FASHION, AND 75% DISAGREE THAT DIGITAL GARMENTS CAN REPLACE THE NEED FOR PHYSICAL FASHION

Do you think that purchasing a digital garment can replace the need to buy a physical garment? [% of respondents]

Do you think that in the future, digital luxury products could substitute physical ones? [% of respondents]

RESPONDENTS WHO ALREADY PURCHASE DIGITAL-ONLY FASHION ITEMS EXHIBIT A STRONGER BELIEF THAT DIGITAL FASHION CAN SUBSTITUTE PHYSICAL APPAREL

Do you think that purchasing a digital garment can replace the need to buy a physical garment? [% of respondents who already purchased digital fashion]

Do you think that in the future, digital luxury products could substitute physical ones? [% of respondents who already purchased digital fashion]

Source: consumer survey with over 2,800 respondents conducted in May 2022, BCG analysis
CHAPTER III

ONE IN FIVE DIGITAL USERS AGED 18–25 ALREADY BUYS APPAREL SPECIFICALLY TO CREATE DIGITAL CONTENT

Have you ever bought clothes only to create digital content, e.g., specifically to make a post on social media? [% of respondents who answered “Yes”]

DIGITAL FASHION IS MOST POPULAR AMONG DIGITAL USERS IN ASIA, AUSTRALIA, AND NEW ZEALAND

[% of respondents who purchased digital-only fashion item]

Source: consumer survey with over 2,800 respondents conducted in May 2022, BCG analysis
Although digital fashion shows promise as an alternative to some physical fashion purchases, we see digital technologies to be an even more powerful sustainability lever for the fashion industry. Advocates of Scenario 3 hypothesize that digital technologies could help reduce the supply-demand mismatch, contributing to less excess inventories and production process waste. A digital end-to-end transformation, with technology as the foundation of all steps in the product lifecycle, provides the opportunity to streamline operations and reduce waste, helping not only operating margins but also sustainability efforts.

One exciting technology is 3D design, which allows designers to create and simulate new products exhaustively, significantly reducing the number of samples needed in the process. While an augmented reality model of an item cannot show how a fabric feels, it is increasingly better at showing how the fabric might sit on a model and the overall stylistic vision. On top of making the supply chain more sustainable, 3D design technology can spur creativity. For example, Adidas partnered with the digital fashion house The Fabricant and model Karlie Kloss on a design competition. The companies released a free 3D version of the Wind.RDY Parka Jacket from the Adidas x Karlie Kloss collection, and digital designers worldwide could download it, modify it, and submit their designs. Apart from allowing more designers to participate in the design process, the competition also eliminated the need to fly to different cities or host in-person discussion meetings making it more efficient and sustainable. Overall, an end-to-end digitalization of the design process can lead to cutting down on physical samples by as much as 70%. Moreover, the time to market of newly designed apparel can drop by as much as 40%, and the quality of designs improve, which can further translate into lower unsold inventories and reduced overproduction.\textsuperscript{85}

Digital assets like NFTs are another technology with the potential to act as a sustainability tool by helping companies to feel more confident about the buying decisions they are making. For example, digital assets can give brands the opportunity to assess the potential popularity of a colorway, or provide the consumer with a digital good as a reward for pre-ordering. In this way, companies could move closer to a made-to-order model, reducing supply-demand mismatch and overproduction.

Along the product lifecycle, digital twin technology could prove crucial to sustainability goals by ensuring traceability, transparency, and clarity in the supply chain. Currently, effective and precise control of every step in the production process is complex and difficult to establish, particularly at the raw materials level. The introduction of a comprehensive and easy-to-use tool would be beneficial for companies, allowing them to thoroughly monitor the supply chain and optimize pollution and waste production step-by-step. Digital twin itself is a file that is attached to every garment, footwear, or accessory produced and contains all the crucial information about the product, starting with the design, technical parameters, and materials used to prices and locations of its storage and store. Thanks to a centralized system, access to data and history of the product is simple and might be prolonged via a certificate of authenticity, helping resale and
giving the apparel a second or third life.

Technologies enabled by artificial intelligence could also be employed to efficiently solve some of the specific problems of the fashion industry. The supply side of the industry is one problem area that can be improved using AI solutions. Reducing emissions starts well before specific and area-targeted actions, as a company must first understand where and how the emissions are produced. BCG research found that only 9% of surveyed enterprises measure their emissions comprehensively, especially in Scope 3, where it is most difficult to accurately determine the carbon footprint. The AI-driven software tool CO2 AI, developed by BCG Gamma, allows companies to reliably quantify their emissions and monitor the process of reducing them. CO2 AI helps examine the emissions, simulate the impact of proposed changes, and design a roadmap of a net-zero journey.

Augmented reality technology could also be considered as a sustainability solution by addressing the returns in online shopping, primarily caused by bad fit not to the customer’s liking and look. The virtual try-on is a promising solution, which could make the fitting process more convenient, something that consumers would appreciate. Snapchat, which itself leads the AR try-on movement through partnerships with companies like DRESSX or RTFKT, found in their study of US consumer buying preferences that four out of ten consumers said they have declined to make a purchase because they were not able to see or try on the item. Snapchat predicts that this sentiment could contribute to a 37% increase of consumers using augmented reality to try on a clothing item by 2024. Fortunately, many available try-on avatar solutions are often an extension of the 3D design model, simplifying the introduction process for brands and ensuring a high-quality image for the virtual fitting. The reduction in returns generated from the use of AR would directly translate into fewer shipments and less storage handling, decreasing the financial and environmental burden of the fashion industry.

As overproduction is one of the biggest factors in the fashion industry’s emissions, reducing it is a significant opportunity for the sector. Our analysis of metaverse-driven digital solutions is that they might prove to be the best tools for the job, creating an array of opportunities to reduce overproduction and waste that also lend themselves to financial reward. A 2018 research paper published in The Journal of Association of Universities for Textiles puts the number of unsold products at 40% of all produced items. A further negative impact on the environment comes from the fact that some clothing purchased by the customers is never worn—in some countries as much as 40% of sold apparel, according to the World Bank. Overall, while it is currently hard to predict the adoption rate of the described technologies across the whole industry, we estimate that for every 1% reduction in overproduction that the metaverse and digital fashion could drive in the fashion industry, emissions of CO2e would decline by 0.2% to 0.4%.
You were part of Ethereum’s founding team in 2014. Back then, did the founding team already expect the blockchain’s success? Yes. Many of us believed in what we called the “Flippening” from the start—that at some point the market cap of Ethereum will surpass that of Bitcoin. I was (and remain) convinced by it because of the value of Ethereum.

Was sustainability part of the discussion at the time? It depends on who you talked to. Some people in the community did not care at all, some people cared a lot. In general, I would say that the community does not worry about it much. However, Vitalik Buterin (the main founder of Ethereum) always had it in mind. I think the idea of making something more sustainable, like proof-of-stake, was the goal, but no one knew how exactly to do it.

What are some obstacles to addressing issues within the metaverse community? The metaverse community is unique in the sense that it is organized in the so-called “DAOs” (Decentralized Autonomous Organizations). Right now, people are coming up with clever use cases for them. For example, they are pooling capital behind them. One general challenge with that is the limiting nature of the libertarian ethos.
that has been part of the bitcoin community since the beginning. The communities almost always seek activities that are profit-making where there is a free market approach to things. The issue is that things like cleaning up the ocean are necessary, yet [they] don’t have an easy profit model behind them. Cryptocurrencies were, in some ways, built to avoid censorship, but that also meant taxation. If governments are not able to collect taxation, who is going to provide public goods? I do not think anyone has developed a good solution to it so far.

We can see that in many industries ESG factors are important for investors and they are pushing for companies to be more ESG friendly. Have you seen this trend in Web3 investing? No, I haven’t seen it on the Web3 side of things. It is interesting that you bring it up—maybe someone should create a Web3 ESG fund.

Can you tell me more about your new venture, MetaMetaverse? Interoperability in the metaverse is a common and complex issue. Right now, all metaverses are different spaces that exist disconnected from each other. One of the first features we have built in my new venture the MetaMetaverse is a metamap—this ability to connect different metaverses with a common way of addressing space. Another feature is this web browser technology to consume them. Moreover, there are also 3D assets with different file formats. Currently, the problem is that some of the main metaverses like Sandbox and Decentraland sometimes push for their proprietary data formats and style. I am in Open Metaverse Alliance with them. I believe that together we can work towards interoperability.

You are a futurist. If you look into 2030, can you imagine a world in which everyone has an avatar and purchases digital fashion? Or will it still be a niche? I think the world is generally moving in that direction. I think progress will be generational. Every generation makes its own social media platform and has some new additions. I expect some of these things to be part of it, as they are ways of expressing oneself. A great example of how people are constantly trying to express themselves better is the evolution of emojis. Instead of having a simple kissing face emoji, we now have a cat sending a kiss, and so on—it helps people convey how they are feeling better.

What are some sustainability-related issues that are specific to the blockchain community? I would say that emissions are tricky to track in the crypto community. In other industries, you have standards organizations that come together. It is a lot more regulated. In the blockchain community, you lack an organization that is funded and that people trust to certify. For example, if someone claims a certain amount of energy for cryptocurrency mining comes from hydropower, it will always be someone that has a lot of investment in crypto, and there is a good response to be somewhat
skeptical if they are just “shilling” or providing accurate information.

At the same time, it might be easier to check how much energy an NFT shirt has consumed than to check the entire supply chain of a real shirt? I think that’s an interesting point. Of course, you can easily check how much energy an NFT used up. Still, there is an issue with the lack of checks and balances within the community. For example, the Bitcoin Foundation is an organization that is there to represent and advocate for the Bitcoin community. It is not one to provide accurate information on it.

In general, what do you think about established companies entering the NFT space? I think it’s cool for them to experiment with it. NFTs are a whole new global digital collectible market. I think the most successful NFT projects are those that targeted influencers with large reaches and that built an exclusive community. I think we will see a whole new wave of large scale metaverse activations once that technology has evolved a bit more.
The fashion world is moving into the metaverse, a journey with the potential to enhance customer relations and reinvent sustainability models. As discussed in Chapter 3, fashion in the metaverse could threaten industry sustainability targets if its growth relies on technologies that generate high CO2 emissions. However, it could also prove to be an opportunity to disrupt traditional ways of work and help the industry meet its ambitious sustainability agenda. The time to act and to use technology to the advantage of the environment is now, before digital fashion faces exponential growth. We believe that the most prominent fashion companies have an even greater responsibility to act as sustainability leaders in the digital realm than in the traditional business realm. Companies must act as educators: although consumers care about sustainability, they do not always realize the impact that their digital purchases can have on the planet. Additionally, as the promise of Web3 is decentralization, it lacks regulators who could help solve environmental issues. To ensure that fashion's presence in the metaverse does not come with an increased carbon footprint, industry leaders must proactively address this new technology with sustainability at the forefront of their agendas.
A FASHION-FORWARD JOURNEY INTO THE METAVERSE

Despite thousands of NFTs already created and millions of dollars already traded on the market, one thing is clear: this is just the beginning. The fashion world is at the start of its journey into the metaverse. While fashion companies have several reasons to embark on this journey, one of the biggest ones is their consumers. Gen Z and Gen Alpha have embraced proto-metaverse platforms and are spending more time than before playing, socializing, and shopping in digital spaces.

New, digitally native brands such as RTFKT, The Fabricant, and DRESSX are already making a play at capturing this younger audience, while digitally exclusive communities such as Bored Ape Yacht Club and CryptoPunks are redefining what luxury means. Some of these digital players already show aspirations extending beyond the digital to the physical realm, currently dominated by traditional players. Web3 investor and influencer GMoney has launched 9dcc, a crypto-native luxury brand that will offer iconic black T-shirts available exclusively to his token-gated community on Discord. Meanwhile, lifestyle brand Hndsm launched the first CryptoPunk-branded collection priced in US dollars with no token-gating to restrict access. The positive response to these releases shows that established brand recognition cultivated by traditional players is a major marketing advantage also in the metaverse.

The modern digital consumer wants the brands they are familiar with to meet them in the metaverse. Over time, digital marketing has increasingly replaced traditional marketing as consumers spend more time online. Almost all major fashion brands have social media accounts to engage and connect with their consumers, often using these accounts to announce fashion shows and new collections. Still, there is the possibility to go even further in the metaverse. The metaverse creates opportunities for fashion companies to reimagine consumer relationships and connect with customers in new ways. However, with opportunity comes responsibility, and sustainability must continue to be a key focus of the fashion industry in the metaverse.

Companies can continue to elevate sustainability as a priority in the metaverse by embracing their role as consumer educators. Proactively educating the consumer on the environmental impact of digital purchases can strengthen consumer trust and combat greenwashing associations. Digital consumers recognize the importance of sustainability, but only up to a point. We asked our survey respondents how much they care about...
climate change and environmental sustainability on a scale of 1 to 10. The average response was 7.7, but this interest does not always translate when buying digital assets. Nearly half of survey respondents do not consider sustainability when purchasing digital assets.

Even though it requires a certain amount of research to understand the sustainability impact of blockchain, some are aware of it. As one of our responders stated, “I am hugely concerned with the environmental impact of NFT minting and smart contracts, but I am also a strong believer that the proof-of-stake alternative will significantly reduce that impact.” Our survey, targeted at digital users, found that 11% of respondents do not invest in cryptocurrencies or NFTs because of environmental concerns, 6% invest in cryptocurrencies or NFTs based on sustainable technologies, and 6% buys carbon offsets. While the sustainably savvy digital consumer is becoming more prevalent, many haven’t considered it. Common sentiments among those surveyed were, “I haven’t evaluated the impact of virtual assets on sustainability” and “I didn’t know the eco-impact at the time I bought it.”

**SUSTAINABILITY IS GENERALLY PERCEIVED AS IMPORTANT BY CUSTOMERS BUT RARELY CONSIDERED IN THE CONTEXT OF DIGITAL ASSETS**

On a scale 1–10, how important is sustainability to you?

<table>
<thead>
<tr>
<th>Region</th>
<th>Score</th>
</tr>
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<tbody>
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<td>South America</td>
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<tr>
<td>Asia</td>
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<tr>
<td>Australia &amp; NZ</td>
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<tr>
<td>Eastern Europe</td>
<td>7.3</td>
</tr>
</tbody>
</table>

Source: consumer survey with over 2,800 respondents conducted in May 2022, BCG analysis

Does sustainability impact your decisions to purchase virtual assets?

[Multiple answer question, each answer % is out of 100]

- Not really: 48%
- I don’t invest in cryptocurrencies or NFTs because of environmental changes: 11%
- I invest in green crypto or NFTs: 6%
- I buy carbon offsets: 6%
- I purchase virtual assets (e.g. digital fashion or NFTs) to reduce purchases of physical goods: 5%
- Other: 3%
- I don’t purchase virtual assets: 33%

Source: consumer survey with over 2,800 respondents conducted in May 2022, BCG analysis
As they move into digital fashion, brands should include educating consumers on digital sustainability as part of their value propositions. For example, the mission statement of DRESSX reads: “We share the beauty and excitement that physical fashion creates, but we believe that there are ways to produce less, to produce more sustainably, and not to produce at all.” The company also produces annual sustainability reports and visually summarizes the findings. The Fabricant, another digitally native brand, states on its website: “We waste nothing but data and exploit nothing but our imagination.”

It is clear that established fashion brands have a reason and the tools to enter the metaverse—the question is how to do it with sustainable responsibility.

ENTERING THE METAVERSE SUSTAINABLY

Embracing the metaverse comes with sustainability challenges as well as opportunities. Companies need a roadmap for how best to enter the metaverse so that their entry does not jeopardize their sustainability agenda but supports it. Among the challenges that fashion companies face are: How to measure impact? How to pick the most sustainable metaverse and NFT options technology-wise? How to use these new digital technologies to reduce waste and emissions at scale? There are several actions that digitally fashion-forward companies can take to address these challenges and lead the way into the metaverse.

Measure holistically. Ever-changing consumer preferences and developments in technologies make it difficult to quantify and predict the environmental impact of digital fashion. To proactively address the climate impact of digital fashion, the fashion industry should prepare for the worst-case scenario of the highest environmental impact. Industry leaders should calculate the additional environmental impact created by digital fashion and how it translates into their overall footprint, working on solutions that allow them to meet their emissions reduction targets.

Choose technology consciously. Fashion companies should promote and select the most environmentally-friendly technology solutions possible. This means selecting NFT and metaverse options powered by renewable technology or other non-carbon sources and actively supporting efforts to increase energy efficiency in servers. As described in Chapter 3, the proof-of-stake mechanism generates a significantly lower CO2 footprint than the proof-of-work mechanism. While Ethereum merged weeks before this report published, lower carbon alternatives already exist. Solana NFT marketplaces are developing quickly: In June 2022, the Magic Eden Solana marketplace secured $130 million in Series B funding. Alternatively, a system based on proof-of-stake or other lower-carbon alternatives can be set up by private blockchain developers. For example, Burberry launched its first NFT in the game Blankos Block Party, which is built on a private EOSIO blockchain that uses the proof-of-authority model. The fashion company stressed that this system is “more environmentally friendly and sustainable than the proof-of-work model.” While necessary, consciously choosing technology can also present challenges as some
pro-sustainability solutions can turn out to be very energy-consuming, and new blockchain systems can experience more technical problems.\(^{95}\)

**Employ offsetting or insetting strategies.** Fashion companies should engage in carbon offsetting, especially if using sustainable blockchain is impossible or if metaverse activity results in net higher emissions. For example, DRESSX funds the conservation of old trees, which generally absorb more CO2 than their newly planted counterparts; Aldo announced that the shoe brand is now climate neutral, partially by purchasing renewable energy credits. BCG has signed a ten-year partnership with Climeworks to purchase its carbon dioxide removal service, capturing carbon dioxide directly from the atmosphere and storing it underground. While carbon offsetting can only reduce 20% of annual greenhouse gases, carbon insetting is more direct, aiming to reduce GHG emissions within a company’s supply chain. Recently, Ganni has partnered with a longtime supplier in Portugal to build a solar power plant, while Levi’s has partnered with the International Finance Corporation to support mills and factories in reducing energy and water use.

**Use the metaverse innovatively.** As we explored in Chapter 3, fashion companies can use blockchain and other metaverse technologies to help reduce their GHG footprints. For example, blockchain can be used throughout supply chains to better verify environmental impact. Suppliers can register their activity on the blockchain and verification systems can check emissions holistically.\(^{96}\) One example is the OpenSC blockchain, created in part by BCG Digital Ventures, which makes it possible to “verify claims about low-carbon and responsible production in an automated, continuous way, backed by granular and immutable data.”\(^{97}\) Blockchain-based emissions tracking is being used in the fashion industry as well. LUKSO, an energy-efficient proof-of-stake blockchain, conducted its first practical use case at the Helsinki Fashion Week 2020 by digitalizing and registering each item on the LUKSO blockchain. After the event, the clothing was easily identifiable and traceable in stores.\(^{98}\) Additionally, the non-profit Aura Blockchain Consortium was created in April 2021 and includes LVMH, Prada Group, Cartier, OTB Group, and Mercedes-Benz—the companies are working together to transparently track and release information on emissions and move toward circular business models.

**Lead responsibly.** The largest fashion companies have a significant responsibility as sustainability leaders in the digital realm. Although consumers care about sustainability, they do not always realize the impact that their digital purchases can have on the planet. Fashion companies must lead responsibly to ensure that their digital presence does not come with an increased carbon footprint.

Any combination of these steps can help established fashion companies become sustainability leaders in the metaverse. There is no single solution—instead, each fashion brand has the opportunity to carve out a distinctive digital identity that features its activity on behalf of the planet.
JOURNEYING WITH SUCCESS

The benefits of entering the metaverse can be substantial if brands clearly define what goals they want to achieve in the phygital realm. Although environmental risks undoubtedly exist, they can be holistically considered and proactively mitigated. Thoughtful players will use the new technology to be leaders in the digital space, while innovative players will also use it to improve their existing processes and reduce their environmental impact. Ultimately, every company will have to decide what best fits its business model and target audience. While the digital journey will be unique for each company, we have compiled several considerations that can help any fashion brand venture into the metaverse with success.

Organize for the metaverse. Fashion companies are already forming Web3 and metaverse teams, sourcing internal talent or hiring Web3 enthusiasts on the market. Kering has announced a dedicated metaverse unit, with its Balenciaga brand leading the way. LVMH has appointed a head of Web3 and metaverse to work with all brands in the group. Gucci has formed a Dream Big team as part of Gucci Vault, while Adidas built a Web3 studio around the team who successfully launched the Into the Metaverse campaign. According to publicly available information, internal teams have also been launched at Nike, American Eagle Outfitters, Burberry, Hugo Boss, Levi’s, Givenchy, Kenzo, and Under Armour.

Build partnerships. Partnerships are more important than ever in the metaverse, where the community-building aspect is so crucial. Many successful campaigns are resulting from cooperation between established fashion industry leaders and digital influencers. For example, Dolce & Gabbana is partnering with the leading digital fashion platform SKNUPS to “bring their Italian signature style into games.” Other fashion houses are working with established digital artists. Givenchy partnered with the 24-year-old artist Chito to create a series of 15 collectible NFT pieces of art. Adidas teamed up with NFT pioneers GMoney, Bored Ape Yacht Club, and PUNKS Comic, while Tiffany partnered with CryptoPunks for its NFTiff launch. Other examples included Gucci x Superplastic and Bershka x DRESSX.

Consider M&A options. In the most notable move so far, in December 2021, Nike acquired RTFKT, a startup famous for digital sneakers; terms of the deal were undisclosed. The startup raised $8 million in a seed funding round in May 2021, led by Andreessen Horowitz, that valued the company at $33.3 million. However, following its dashing avatar partnership with artist Takashi Murakami called CloneX—a collection of 20,000 avatars that traded at some point for $68,000 a piece—it was rumored that Nike paid over $1 billion. Our outside-in estimate, based on publicly available data, is that since being acquired by Nike, RTFKT has generated nearly $250 million from its NFT drops. This illustrates that thoughtful acquisition can help build metaverse capabilities that can be leveraged at scale by established fashion players.

Close technology gaps and build capabilities. As we embark on this major technological shift, the time to consider closing technology gaps is now. Companies should undergo
overdue or postponed digital transformation programs or cloud migrations, leverage data analytics and AI, and then get to work building the technical platforms, tools, and capabilities that will facilitate metaverse strategies.

**Protect IP and trademarks.** To protect their intellectual property and prevent infringement in the metaverse, fashion companies cannot rely on their existing registered trademarks unless they cover classes such as computer software. In the most notable case so far, in January 2022, Hermes took legal action over the use of its trademarks in the metaverse against digital artist, who sold a series of 100 MetaBirkin NFTs that resold on the secondary market for up to $65,000.103 In August 2022, Hermes filed a comprehensive trademark application covering NFTs, cryptocurrencies, virtual goods marketplaces, virtual clothing, footwear, and fashion shows.104 Our outside-in desktop research based on public sources revealed a number of fashion companies have already filed for metaverse trademarks, including Adidas, Versace, Hugo Boss, Gucci, Balenciaga, Levi’s, Nike, Puma, Ralph Lauren, Kate Spade, Under Armour, and DKNY.

As the world of fashion ventures into the metaverse, the prevailing business model of the industry could shift in three directions at once: toward the metaverse, toward sustainability, and toward the greater productivity achieved with new digital technologies. True industry leaders will remain committed to sustainability, embracing the metaverse while achieving their financial and environmental goals.
Adidas had one of the most successful NFT projects in the industry. How did it all begin? At the end of Q1’2021, NFTs were surfacing as a topic and the company wanted to have a point of view. It was triggered by Elon Musk’s moves with Bitcoin and we were being approach by partners about it, but there was no “head of Web3” back then. I happened to be in crypto for about six months at that point, so I already knew a bit in contrast to many at Adidas. I was lucky enough to team up with Erika Wykes-Sneyd, who was VP of brand communications at Adidas Originals at the time. Along with others, we decided to channel that energy in the company into a Task Force. Once we had the team, we hired a boutique consulting agency to help us think through what this really meant from the brand’s existing standpoint. We decided to resist the temptation to jump in too fast and take a more thoughtful approach about how to enter authentically. I think it was a very important choice.

And then you launched your first NFT project with Trevor Lawrence? Yes—it was a relatively small project, but it was a good opportunity to work with an amazing athlete and experiment fast. It really helped us figure out how NFT drops work from a legal and financial standpoint. We wanted to be able to foreshadow what challenges we might encounter when doing something bigger.
What about your second launch, “Into the Metaverse”? Why did you decide to partner with Bored Ape Yacht Club (BAYC), PUNKS Comic, and GMoney? Adidas has always been a brand about collaboration with pioneers, whether in sport or culture. That was especially important here where we were entering a new space that we needed to learn a lot about. Bored Ape Yacht Club stood out for their approach on giving IP rights to their holders; the Pixel Vault team had a really innovative way to bring these NFT characters to life in the Punks Comic; GMoney has been such a major figure in making NFTs accessible for so many. Everyone had a valuable role to play—and the team worked! All these connections were basically made in Twitter through Ben White, a member of the team. This was before the massive BAYC hype, so our timing was quite fortunate!

Would you say that partnerships are important in NFT launches? How are they done successfully? Yes, definitely. You need to figure out who to team up with and what you can offer to the partnership. The thinking at the time was that Adidas is known for making great product, so we bring that. That is why we decided to go for NFTs that are redeemable for physical products: only NFT owners can access them. Apart from giving value to an NFT or extending an experience, physical items are also a great way to create an even stronger sense of identity around a project. It’s a way for dedicated consumers to show what they belong to. Now you see many NFT projects have their own merch.

Tell me more about NFT redeemables. A redeemable means that by owning the NFT, you have the right to redeem an item with no extra cost (other than “gas”). In that sense, the NFT is like a key to unlock something—its value depends on what it unlocks. Sometimes the NFT is consumed, or “burned” in the act of redeeming the item, like a ticket you hand over. In this case, the NFT changed “state” so you could tell if the product had been redeemed, but you still had an NFT afterwards. This was an important choice because it meant we could still have a community of NFT holders once the product drop was done.

In addition to launching an NFT redeemable, you built an entire community around it. How did you do that? As the project advanced, it became clear that it was going to be about a lot more than just redeeming physical product! It was a new Web3 membership community. For a major brand like Adidas to team up with pioneers in the Web3 space was a big deal, which people were really optimistic about. The community obviously was seeded by the respective communities around our partners. But there needed to be a way to bring the most loyal consumers in as well – people who couldn’t afford a Bored Ape but wanted to be apart of it. That’s where the Adidas CONFIRMED app came in, which I was responsible for. The app focuses on premium streetwear and
rewards loyal members with better access. So, our most engaged consumers received a push notification with a link to claim a “POAP”—a token that they’d later be able to use to access the drop and join in. After that it was really about having a place to communicate with them all, which started with a dedicated Twitter account. We really saw that come to life the night of the drop! Tens of thousands of people were tuned into Twitter, seeing all that was going on; it didn’t go without some hitches, so there was plenty of drama—the highs and the lows—it was a ride! And it generated a lot of buzz.

Was there a separate team that had full oversight over the project? In part, yes. The Task Force we put together was responsible for the whole thing. But, initially, none of us were doing it full time. That got pretty interesting when you’re approaching Q4 and you realize you need a lot of support from legal and finance teams who are having their peak time of the year! Luckily, the teamwork kicked in and we made it happen together—so much of the success is owed to them. We immediately started thinking about our next moves. There were so many things to explore beyond what had been looked at, with potential across the whole brand, especially the sport side of things. The board agreed to a proposal to create a dedicated team, which is now led by Erika—probably the ideal leader to bring a brand like Adidas further into this space.

Would you say that this experience is different for a large brand like Adidas than for small Web3 projects? For sure. A big brand cannot move as fast as small native Web3 projects, but the staying power of a big brand is much stronger. You can see how important that is at a time like this, when many projects that were promising a lot have struggled in the current market.

Apart from being an interesting new category of products, how can NFTs change the industry? I’d like to see NFTs used to help solve the problem of bots buying up the most coveted sneakers and then selling them at a profit in the secondary market. This has been a problem in the sector for years, as consumers who really want and deserve the product sometimes struggle to get access during the launch. I think that NFTs can help with that, as that is a credential that can’t be faked or duplicated. It is niche now, but I think that such token-gated commerce has a lot of potential.

In general, when you look into the future, where do you see the biggest opportunities for brands and Web3? I believe brands have an opportunity to live out their brand purpose more fully than they could before. In the case of Adidas, the core belief is that “through sport we have the power to change lives.” Currently, the company is doing this by creating world-class sports and lifestyle products for people to wear on the field or in the street; it’s equipping them and giving them a reason to believe in themselves, their
potential. But when you start thinking about what adidas has in its network—athletes, entertainers, clubs, federations, hundreds of millions of consumers, and then the entire line of physical products—when you start to imagine what could happen if you tokenize that network, then it gets very interesting indeed. If you can make your brand a platform, it unlocks creativity and value through network effects, which could not be created by an entirely centralized company. If you engage your consumers well and can offer value in a community, it attracts more and more people to join it. This is something I believe is true for many brands and talents who are open to such possibilities, which is where I’m going to focus next.

What about your future, what are the next moves for you after Adidas? I am now stepping in the role of President of ScienceMagic Studios. It’s a company which is founded to help brands, talent, and their communities use Web3 to create and share new value. In a nutshell, we partner up to create digital assets and Web3 experiences that drive enduring engagement and value. We have some of the most informed, thoughtful, and creative people I’ve ever met in the space, which is such a joy to be part of. What drew me to it is the unique combination of lenses brought by the founders: deep blockchain expertise from Delphi Digital, the brand and community lens from ScienceMagic.Inc (our sister company) and the macro financial lens with Raoul Pal. It’s a great way to continue on the journey I started at Adidas.

What are some challenges that you see for the industry? For a lot of brands, knowing where to start is quite difficult, especially because the technology partners are sporadic. The metaverse is also full of risks: there’s a fast-flowing feed of good news and bad news every day or every quarter—it’s a little intimidating. The hardest thing is knowing how to make a wise entry, what capabilities stack are internally needed, who to collaborate with, and how to demonstrate things proof point by proof point—and that’s the story of corporate innovation. But opportunities are on our doorstep for the bold, and the right help is out there to make a real difference.
RESEARCH METHODOLOGY

Our analysis of the impact of the metaverse and digital fashion on the fashion industry’s future is mainly derived from three sources: our proprietary model, our qualitative interviews, and our quantitative survey.

Our proprietary model of industry dynamics focuses on use cases of video game skins, digital fashion, and NFTs minted by fashion companies. For each use case, we model fashion in the metaverse market size by 2030 in a base case and in a bull case. We also hypothesize three scenarios—a high-carbon metaverse, a light carbon metaverse, and a metaverse as a force for good—and evaluate their potential impact on the CO2 emissions of the fashion industry as a whole.

Our qualitative interviews include interviews with fashion and gaming senior executives and consumer interviews with early adopters of digital fashion and Gen Alpha teenagers interested in social video games.

Our quantitative survey, conducted in May 2022, includes more than 2,800 respondents from around the world: 41% from North America, 30% from Europe, 17% from Asia, and the rest from other geographies. Our survey targeted digital users: tech savvy, internet present people, that heavily use digital channels — Web, mobile and social — to consume content, engage with brands and complete transactions, to assess the motivations and behaviors of customers who have already purchased NFTs or digital fashion or intend to do so in the next 12 months. As such, respondents are mostly GenZ and Millennials. Since the metaverse, digital fashion and NFTs are still niche topics for the general population, the survey covered also general attitudes towards online presence and appearance, digital assets, and sustainability.
AUTHORS AND CONTRIBUTORS

Kasia Jordan-Kulczyk
CHAIRWOMAN | PUBLISHER VOUGE POLSKA

Oktawian Zajac
MANAGING DIRECTOR & PARTNER, HEAD OF BCG WARSAW | BCG

Barbara Zaleska-Szubert
PROJECT LEADER | BCG

Sandra Pretchynska-Plichta
SENIOR ASSOCIATE | BCG

Szymon Machnikowski
DIRECTOR OF MARKETING & PR | VOUGE POLSKA

Agnieszka Szer-Andrzejczak
HEAD OF MARKETING & COMMUNICATIONS BCG WARSAW | BCG

Zuzanna Krzatała
SUSTAINABILITY MANAGER | VOUGE POLSKA

Jowita Michniowska
PROJECT MANAGER | VOUGE POLSKA

Maciej Winiarski
SENIOR ASSOCIATE | BCG

Maciej Dejneka
ASSOCIATE | BCG

Aleksandra Paszczyńska
DESIGNER | BCG

Maria Świątek
ASSOCIATE | BCG

Tomasz Zachwieja
ASSOCIATE | BCG

Aleksandra Pająk
MARKETING & COMMUNICATIONS SPECIALIST | BCG
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CONTACT

For any questions regarding the report please contact authors directly or reach out via:
warsustainability@bcg.com
sustainability@vogue.pl
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