THE REAL-TIME ROADMAP

UNDERSTANDING THE FIRST WAVE OF FASHION'S 3D JOURNEY. AND SURFACING WHAT COMES NEXT.

Created by CLO Virtual Fashion

Image Courtesy of Gary James McQueen

ORIENTEERING: REAL-TIME FOR REAL PEOPLE

Look around, and 3D is already everywhere. The media we consume, the products we browse for and buy, the experiences and cultural touchstones we share, and the devices we work and play from. We might interact with these things on flat screens, but all of them are designed, engineered, built, advertised, or experienced (or all of the above) in three dimensions.

But as the world changes around fashion specifically, 3D is also becoming a tool for everyone. Not just the engineers or the artists, but the executives, the master merchandisers, and a whole spectrum of end users across a massively diverse set of up and downstream disciplines.

Fortnite X Balenciaga

So, after years of researching and writing deep-dive reports on digital product creation ("DPC") and 3D for the dedicated user community behind the first wave of fashion's 3D journey, The Interline - with support from Epic Games, creators of the cultural juggernaut that is Fortnite, and developers of the most widely adopted and accessible tools for real-time visualisation available to apparel, footwear, and accessories - set out to create an educational reference point for what's next, hot on the heels of Unreal Fest 2025, and intended for the expanded, enterprise-wide cohort of fashion professionals who will soon be engaging with 3D, if they aren't already.

This new roadmap to the benefits, the business cases, and the creative and commercial possibilities of real-time 3D is designed to be essential orienteering and hands-on guidance for anyone who works in fashion's immediate or extended orbit.

Like the new generation of real-time 3D tools, which package the proven, cross-industry power of the biggest real-time engine into intuitive applications, you do not need to be a 3D artist, a garment engineer, a senior digital transformation executive, or an expert in rendering to find value in this handbook. But even if you are, the key lessons from fashion's first wave of 3D transformation, and the trajectory for what's coming next, could still surprise you.

Generated in Twinmotion

So, for anyone who finds themself obsessing over creating products or producing photoreal final pixels for content, spends their days making mission-critical choices that influence product outcomes, lives through minute-to-minute collaboration with colleagues and partners, or fastidiously explores new channels and horizons, this report will give you:

- **A benchmark of fashion's current state of 3D / DPC maturity:** how digital transformation became tied to digital product creation, where the industry has found success with DPC so far, how the brands at the frontier have measured their progress, and where some elements of the vision have fallen short.

- **A realistic definition of real-time 3D**, along with an understanding of where it intersects with established DPC tools and workflows, where it diverges, and why it matters to an industry seeking a new model of creation, collaboration, and communication - and a new framework for alignment and decision-making.

- **Clarity on the differences between "digital fashion" and digital product creation**, and why the business opportunity of digital-only goods and cross-media collaborations needs to be separated from the more fundamental shift towards real-time 3D.

- **A strategic outlook at industry-wide priorities**: what fashion, footwear, luxury and other sectors intend to accomplish with 3D in the near future and in the longer term.

- **A breakdown of the pipeline the industry will need to deliver on its transformation objectives**, examining the tools, processes, digital humans, and cross-industry best practices that will be required to deliver on the next wave of use cases and investments made across 3D-native product creation, communication, decision-making, and story-telling.

- **A look behind the curtain at the real capabilities of the real-time toolkit, and the business cases for adopting it**, demonstrating what other industries' successes with real-time 3D might have to teach the wider cohort of professionals who will be instrumental in investing in, supporting, and building what's next in 3D.

HOW DIGITAL TRANSFORMATION BECAME TIED TO DIGITAL PRODUCT CREATION

No matter the product, fashion has always been in the story business. From the purest functional workwear to the most lavish ornamentation of high society, and from high-velocity mass market basics to the sharpest edge of luxury, the industry thrives or falls based on how well it can turn ideas into narratives that people can buy into.

Depending on who the people are, those stories can be purely grounded, designed to take flight to uncharted places, or anything in between.

In-house teams and partners primarily need the objective facts. What categories, styles, and SKUs are going to make up the next assortment? Where are the key fabrics being sourced from, and where have they been used before? How will this product perform with repeat wear, or in the rain? What manufacturing operations will be needed to make it? What's the target margin?

External audiences want something completely different: a fiction that offers a window into a lifestyle; a larger-than-life account of heritage, craft, and exclusivity; a more open door to people from every background; the key to unlock a new aesthetic or hit a new personal athletic benchmark.

And in the middle are the stories that rest on objective foundations - hard product data - but visualise, articulate, simulate, and showcase in a way that bridges the gap between audiences and unifies everyone around a shared vision for how possibility becomes product.

But fashion is already staring down the end of an extremely disrupted year, with more uncertainty to come, and both types of stories are getting harder to tell. From big strategic branding swings and creative campaigns, to everyday design, development, and decision-making, every tale comes loaded with more friction than ever before. And every margin target, every merchandising decision, and every creative or technical choice, once committed to, feels like it's just one geopolitical or environmental rug-pull away from backfiring.

So fashion has a set of historic story problems on its plate today. Which, by definition, means the industry is also staring down a complicated set of business problems.

NO MATTER THE PRODUCT, FASHION HAS ALWAYS BEEN IN THE STORY BUSINESS

As acute as it all is in 2025, though, disruption in fashion is nothing new. And fashion companies of all shapes and sizes are rightly proud of having lived through major economic, cultural, and platform shifts before, and having emerged on the other side. Innovation and transformation, too, were forged and refined in those core shifts: after those trials, the ways brands and their partners design, engineer, make, and tell stories (internal and external-facing) about their products looks markedly different today to how they looked just a few years ago.

Like a lot of industries, the strategic imperative of steering, benchmarking, and advancing that process and systems evolution in fashion has fallen under the analyst label of "digital transformation," because so many of those tasks have had big software, data, and digital asset components to them. Business transformation, today, is usually a combination of technology implementation and process evolution - no matter which industry it applies to.

But unlike service industries and other sectors where the data or the software is the end deliverable, fashion stands out from other segments because of the uniqueness of what it creates: that hard-to-capture but unmistakable-when-you-see-it combination of data, heritage, culture, and craft. And all of this is then wrapped up in a finished physical product that signifies a tremendous amount about the people who wear it, and that tells a profound story about the global network of creative professionals, commercial experts, and craftspeople who made it.

Fashion is a business just like any other in the speed it has needed to change, and the tools and best practices it's used to manage that transition - but it's a business unlike any other, even under the umbrella of consumer products, in several key respects. Fashion's transformation journey has been so strongly shaped by the need to create culturally and personally significant products digitally, tell two-pronged stories digitally, honour heritage digitally, reflect culture digitally, and safeguard craft and expertise digitally.
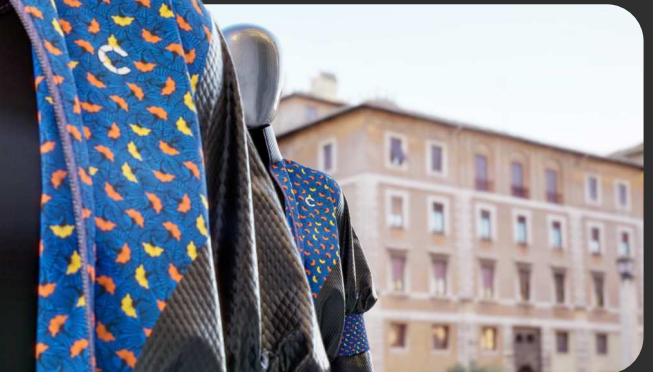
Images courtesy of CLO Virtual Fashion

In that context, digital transformation in fashion has picked up a much stronger association with 3D than in almost any other sector - even those, like industrial design, where the switch from manual, pen-on-paper drafting to 3D CAD was seen as a slam-dunk. The result has been the rolling-up of the drive to transform and the need to tell stories into a snowballing ecosystem of 3D-native tools, a spectrum of processes, a new mindset, and a global community that's collectively referred to by the acronym DPC, or Digital Product Creation.

"Digital product creation is the application of multiple technologies integrated to evolve the way we design, develop, collaborate, and commercialise products," Beth Jackson, an experienced fashion industry DPC professional, told The Interline. "A brand's ability to strategically leverage and combine 2D, 3D, and physical creation methods to effectively support and enable its identity is [now] its 'secret sauce'. This allows for a fundamental rethinking of the product journey."

Generated in Twinmotion

Together, the tools, processes, philosophies and people under the DPC umbrella have proven to be fundamental to fashion's ability to transform across the industry's expansive surface - to meet consumers with high digital expectations, to capitalise on new channels, and to tackle some of its biggest challenges of the past decade.

Where most categories of technology, and most classes of solutions, have been pointed at relatively narrow problems and ideas, DPC in fashion has picked up the expectation that it will tackle all those challenges and uplift all those opportunities - all at once.

And that high bar is reflected in how quickly different sectors of the broad-brush fashion industry - footwear, accessories, and apparel - have elevated 3D to the centre of their digital transformation efforts in a condensed period.

"3D in fashion has evolved significantly since we started in 2018," says Ryan Howell, Co-Founder / CEO of buzzy 3D capture and creation platform M-XR, which secured an investment from Epic Games in 2022. "What was once an afterthought is now being recognised by brands as core infrastructure - especially for operations and ecommerce. We're now seeing 3D visualisation play a key role in helping teams work more efficiently and engage customers in more interesting and dynamic ways. And brands are starting to see that 3D assets unlock richer storytelling—whether it's about selling an individual product or bringing to life the history and identity of a brand."

Based on The Interline's experience, the crossover between the acronyms 3D and DPC may have become blurrier, and both have certainly taken on increasingly complex definitions over time - but the core philosophy between them has always been simple.

PI Workshop

To make the best products it can, and to tell the best stories about them to internal and external stakeholders, fashion has coalesced its digital transformation efforts around the aim of creating the most accurate 3D representations of those products, their intended use cases, and the humans who will eventually wear them. Then, the common objective is to have those digital reflections stand in for physical alternatives wherever possible, so that real choices can be made based on them, leading to the best possible outcomes for the products themselves, made in more streamlined and better-informed ways.

Now, as you might expect from a strategic prioritisation and process transformation exercise of this scope, scale, and duration, there are differences of opinion around how far that streamlined vision has been proven out. But nevertheless there remains strong alignment within and around fashion that swapping out and supplementing longstanding 2D-native systems and workflows for 3D-native alternatives is the right idea, even if the correct approach to execution is less clear-cut.

"In an industry where physicality reigns, working in 3D just makes sense," says Pierre Maheut, Director of Strategic Initiatives and Partnerships for Adobe Substance 3D, the de facto suite of tools and libraries for modelling, materials, staging, and asset creation across a range of different industries. "Fashion objects exist in three dimensions—so why shouldn't the design process? By adopting a full 3D definition, from model to material, brands are unlocking new levels of speed, precision, and creative freedom."

FASHION ON AVERAGE HAS NOT ALWAYS FOUND ITSELF PREPARED TO TAKE ADVANTAGE OF THE FULL POSSIBILITY SPACE OFFERED BY 3D TOOLS AND WORKFLOWS THAT OTHER INDUSTRIES HAVE BEEN BETTER ABLE TO CAPITALISE ON

Judged through that lens, where 3D is the logical next step, the first wave of DPC strategies in fashion have already had a quantifiable impact on the industry's ambitions for digital transformation. And in the process, DPC has become one of the most heavily piloted, scoped, sponsored, grassroots-driven, invested-in, talked-about, technologically advanced, and tested initiatives the industry has seen.

According to global research undertaken by The Interline and Fashion by Informa, 87% of fashion companies entered 2025 with a DPC or 3D strategy already in place. Any notion that 3D is an unusual offshoot of fashion, rather than part of the trunk of design, development, and marketing, is simply outdated.

And the brands that have invested the most time, and the right energy, into those DPC initiatives have been able to measure success within some very well-defined lanes. Reducing their reliance on creating physical samples of garments. Replacing some (or even all) of their product

market testing. Transforming design and patternmaking by linking 2D patterns to 3D simulations, and testing fit on digital avatars. And better communicating design intent with their own teams and their supply chain partners through 3D visualisation and virtual photography.

As successful as those discrete applications have largely been, though, fashion on average has not always found itself prepared to take advantage of the full possibility space offered by 3D tools and workflows that other industries have been better able to capitalise on. But at other junctures fashion brands have found themselves pushing ahead of their counterparts in other sectors, and needing to partner with fashion-focused technology companies to push the frontiers of their solutions further.

This push and pull between technological and cultural maturity is something that Jaden Oh, Founder of CLO Virtual Fashion (one of the leading 3D virtualisation platforms and extended DPC ecosystems for fashion) has observed firsthand.

"Fashion, particularly apparel and footwear, has been slower to adopt 3D technologies than industries such as automotive, architecture, and gaming," Oh told The Interline. "These sectors have long relied on CAD-based 3D modeling as a standard, while gaming and entertainment have led the charge in real-time rendering and immersive digital experiences."

"Fashion, on the other hand, has traditionally been rooted in manual craftsmanship – pattern-making, draping, and physical prototyping — making the shift to digital more challenging," he added. "The complexity of soft materials and fabric physics has also been a major hurdle, as accurately simulating textile behavior in digital environments requires advanced physics-based simulation."

"That said," Oh carried on, "the past five years have seen a dramatic acceleration in fashion's adoption of 3D technology. Tools like CLO have become increasingly sophisticated, allowing designers to create highly detailed digital garments and eliminate the need for excessive physical sampling. Fashion companies across the board, from luxury brands to fast fashion and independent designers, have embraced 3D workflows to enhance efficiency and sustainability. While the industry may have started behind others, it is rapidly catching up—and in some areas, such as digital fashion and virtual wearables, it is even pioneering new applications of 3D technology."

That frontier spirit is also something The Interline has documented extensively in our DPC Reports, in late 2022, late 2023, and late 2024. As the brand professionals and technology partners behind fashion's biggest successes with 3D to date have demonstrated in those reports and elsewhere, in almost every isolated process that relies on having a real product for people to look at and make choices based upon, supplementing or replacing that product, and the range of people intended to wear it, with an accurate 3D representation has provided an uplift.

Image created by CLO Virtual Fashion using TwinMotion

Designed by Canberk Karakas for The Interline.
Modeled, textured & rendered in Cinema 4D and Redshift.

Designed by Canberk Karakas for The Interline.
Staged and rendered in Twinmotion by Martin Krasemann.

Designed by Canberk Karakas for The Interline.
Modeled, textured & rendered in Cinema 4D and Redshift.

"From high-performance sportswear to cutting-edge apparel, brands have rapidly integrated 3D workflows, unlocking unprecedented creative possibilities, reducing waste, and accelerating time-to-market," says Pierre Maheut from Adobe. "What's more, fashion isn't just following the tech curve—it's redefining it. Collaborations [between] game-tech giants like Epic Games and Adobe Substance 3D are pushing the boundaries of virtual prototyping, digital craftsmanship, and immersive retail experiences. In some cases, fashion is even leading the charge, spearheading innovation in 3D design and redefining the future of digital aesthetics."

And those advances are being measured in more than just the quality and utility of the digital assets themselves. For the brands that have successfully maintained their positions at the vanguard of digital product creation, there has proven to be just as much - if not more - of a cultural component to the journey as there was a technical one.

"We have impressive quantifiable accomplishments that we've achieved in 3D, but for me, the biggest accomplishment [has been] watching our designers and technical designers advance in 3D, and slowly seeing the shift in our industry's workforce-wide [adoption] of 3D," explained Kayla Woehr, Manager of 3D Visualisation for Apparel at New Balance - a brand on the leading edge of culture and popularity, as well as one that has continued to push the envelope of DPC at the operational level, as documented by The Interline.

Critically, New Balance judges its own successes in 3D for apparel - as well as its other categories, and the all-round success of the wider industry - not just according to how quickly or at what scale professionals can create in 3D, but how comfortable those people are with the vision and the practical realities of transformation.

"Numbers and percents of [our] line shifting into 3D are important, but so is changing people's minds for how they work," Woehr told us, "because ultimately—we won't have true 3D product creation workflows without it".

But like any cog - no matter how large - in machinery as complex as digitally transforming a multi-trillion dollar industry with several distinct product types, not every 3D strategy has been such a straight shot with. As simple as the vision, condensed to its essentials, is. And as compelling as those standalone results can be, for other brands of all shapes and sizes, the DPC pilots, projects, investments, ideas, and innovations haven't always paid dividends according to the high expectations they have inherited from higher-level digital transformation drives - even if they have continued to improve within their own brackets.

As a cornerstone of digital transformation, DPC has been given a heavy weight to carry, and bearing it means achieving success across a broad range of different domains, and aligning results with an evolving set of strategic priorities.

So while digital product creation initiatives have delivered measurable value in individual areas such as sampling, virtual photography, and many more, the fashion industry now faces a new challenge: translating those successes into a more complete and all-encompassing model for business change, creating a way to bind the different modes of storytelling together, and identifying the right foundation to power a different, more inclusive, more intuitive framework for decision-making.

"The apparel and footwear industries have invested heavily in 3D on the assumption that creating progressively better digital assets would lead to a wider range of teams, from sales to product development, being comfortable with making decisions based on those assets," says Joshua Young, a retail and technology consultant, who has a quarter century's experience of scoping and implementing digital transformation and innovation projects for some of the world's biggest brands.

"In practice, even the deepest digital product creation strategies have reached a point where digital samples have replaced some – but definitely not all – physical samples, and the deeper cultural change and the wider shift in infrastructure that were predicted have not fully materialised. This is because companies have only used 3D to change what they use for visual decision-making, but not their business processes, such as reducing seasonal cycle times," Young explained to The Interline.

"That deeper change is also not likely to come from further investment in what are, by this point, well-established lanes - because executive priorities have shifted," he concluded. "While 3D and DPC strategies have focused on sampling and visualisation, there are now bigger concerns such as planning and profitability where their impact has not been as pronounced. There have, to be clear, been plenty of successes within the existing structure of 3D, but these have not translated into a more profound shift in how these industries really operate."

AS A CORNERSTONE OF DIGITAL TRANSFORMATION, DPC HAS BEEN GIVEN A HEAVY WEIGHT TO CARRY

Spoken to off-the-record, there are certainly brand executives who would agree with that assessment. Leaders who are satisfied with the successes achieved in this first wave of digital product creation, but who are also actively seeking new ways to move further towards a more all-encompassing vision for change. And this openness to identify and implement what's next has become more visible over the last few years, as the boundaries of traditional DPC pipelines, processes, and philosophies have come into focus.

So, while DPC initiatives have delivered against a decent part of their original remit, there is now a rising call for a new mandate - not just for deeper-roll-outs of 3D tools and workflows within existing lanes, but for a different framework for visualisation, simulation, collaboration, and decision-making that takes things a significant step further. A search for new ways to reach, captivate, empower, and unite the different audiences that fashion needs to tell stories to, and to equip them with digital tools that transcend the established boundaries.

That is precisely the kind of platform shift that real-time 3D represents, with intuitive applications like Twinmotion (an approachable, accessible user interface and toolset built on top of the power of Unreal Engine) taking considerable strides to stretch the possibility space of digital products, digital environments, immersive, photoreal visuals, and real-time decision-making to a much wider potential userbase.

But simply opening up the technology, as Epic Games has done not just with Twinmotion but with its entire suite of solutions, digital humans, and the real-time engine and content ecosystem that unites it all, is only the beginning. For the fashion industry to truly make the transition from 3D being used on a quiver full of separate standalone projects to an enterprise-wide, fully integrated strategic and operational implementation, brands and technology companies will need to figure out how to really ride this next wave.

And building creative, commercial, and board-room business cases for real-time transformation will, in many cases, start with a re-evaluation of the technical and functional distinctions between the existing 3D paradigm and real-time.

BRANDS AND TECHNOLOGY COMPANIES WILL NEED TO FIGURE OUT HOW TO REALLY RIDE THIS NEXT WAVE

Edit materials in real time

COLOR PICKER

Store

Clear all

R   226
G   183
B   214
E2B7D6

OK   Cancel
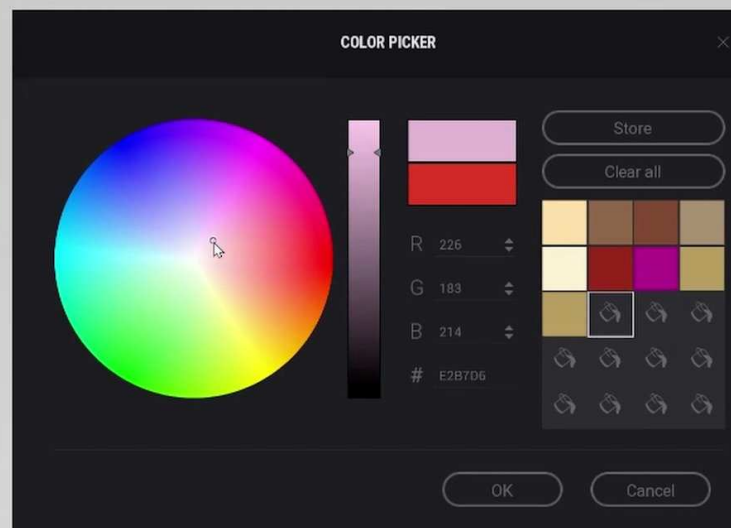
UNDERSTANDING THE REAL-TIME PLATFORM SHIFT

As the userbase for digital product creation has slowly expanded, it has progressively influenced job roles further outside the traditional groups of artists and engineers who were the vanguard and the champions of the first major strategic transformations to be built on a bedrock of 3D.

From merchandising teams making collection decisions based on 3D visualisations, to the professionals populating eCommerce backends with pack shots, product descriptions, and videography, the lion's share of those who can now interact with and be empowered by 3D assets and environments are increasingly not the same people who created those assets, or who helped build the pipelines they travelled through, to begin with.

On the one hand this is a testament to the effort that technology developers, in-house brand leaders, and external advisors have put into spearheading and articulating the value of DPC, and into increasing the odds that 3D files can travel to where they need to be - in a form that almost anyone can use.

On the other, it's evidence that extending the availability of 3D is not equivalent to extending an understanding of how and where it can be useful, nor where it has the potential to become the foundation of a fundamentally different way of working. Seeing might be believing in the here and now, but it does not automatically gift anyone with a longer-term, more strategic outlook - particularly when there are pieces of that future vision that are still firmly under construction.

Generated in Twinmotion

And as fashion begins to really peer beyond the current horizon of DPC, encouraging extended teams to build that kind of outlook could prove critical to ensuring that the industry has the best chance of stitching together the different use cases for real-time 3D to achieve more lasting transformation that transcends traditional domains.

But before we can understand the comparative merits of the two approaches to 3D, a big question is still on the table: what actually is real-time?

From the perspective of a non-technical user in a role that hasn't typically directly interacted with 3D - whether they work in digital marketing or director-level management - real-time 3D is just what the name suggests: a 3D object, environment, or scene that is being actively rendered (read: drawn on screen as geometry in X, Y, and Z axes, with materials and shaders applied on top) at the fraction of a second it is being displayed or interacted with.

The opposite approach - which can carry the traditional designation of "pre-rendered," "static," or "offline" - 3D, or "CG", is drawn in advance of being displayed. By definition, pre-rendered 3D is already fixed and unchanging by the time the end user sees it, because it was rendered ahead of time.

WHAT ACTUALLY IS REAL-TIME?

Generated in Twinmotion

At the point of end-user experience, this distinction means that a real-time 3D scene (a multi-material sneaker positioned in a meticulously-designed replica of an artist's home studio, for example) can be viewed from different angles, zoomed in and out, re-lit, retextured, or a host of other experimentation possibilities without needing to wait for it to be rendered again. The object and environment that make up the scene could have been modelled in a wide range of different 3D packages ahead of time, but the crucial point of differentiation for real-time 3D is that these elements are being drawn and experienced 'live'.

As a practical example, a running jacket could be modelled in a 3D design and 2D pattern development package expressly built for the purposes of apparel creation and simulation, and then textured using digital representations of real-world physical materials from a source like the Adobe Substance 3D asset library.

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The buildings and streets for a city environment could be modelled in an industry-standard modelling or CAD (computer-aided design) tool, and textured using a set of materials from Epic Games' newly-consolidated Fab marketplace.

Both sets of objects would then be exported from their respective tools and imported into an easy-to-use real-time frontend like Twinmotion - which offers a streamlined route to import essentially all widely accepted filetypes - where the user would simply drag them into position, quickly add embellishments to the environment from the in-solution asset library, and then easily configure the weather and time of day.

Through one of several potential deployment avenues, the creator of the scene could then share it with colleagues, customers, or partners who would experience it being rendered instantly as they observe or interact with it - seeing the product in its intended environment in a different way, and even configuring it with different colours and materials if the experience has been designed with an interactive component in mind.

The end result? A scene that captures and communicates product and context in a manner that stops either from becoming brittle, leaving them open to interactivity and immersion, rather than presenting them in a fixed form for interpretation.

By contrast, although a significant amount of modern product and catalogue photography - especially in the furniture and automotive sectors - is created using 3D assets, modelled and textured using the same principles and many of the same tools as their counterparts intended for real-time usage, these static images are rendered over a much longer timeframe (a matter of minutes or longer, versus the milliseconds needed for real-time 3D experiences to reach the right benchmarks for smoothness) as a single frame. This pre-rendering potentially allows for a higher-fidelity end result, particularly where mesh detail and the calculation of lighting and aesthetic material characteristics are concerned, because these, and the camera angles they're observed from, will not be changing variables.

In some cases, real-time solutions make compromises: lighting and other elements that would be hardware-intensive to calculate at runtime can be pre-rendered or "baked" to achieve higher fidelity at the expense of reactivity.

This gap between real-time and offline rendering quality is rapidly closing, however. Real-time tools like Twinmotion and Unreal Engine now offer Lumen, an innovative dynamic global illumination system that calculates advanced lighting effects like true reflections and refractions in real time, and their capacity to handle increasingly complex geometry makes

Generated in Twinmotion

it possible to achieve very high-fidelity results. They also have the ability to switch instantly to a path tracer mode, rendering compromise-free frames comparable to offline quality in minutes.

Outside of that essential difference, pre-rendered 3D and real-time 3D have a lot in common. Both deal with the same fundamental principles of geometry, textures, materials, and lighting. Both share tools and, to some extent, workflows, until the point at which they diverge: when the consideration becomes whether the intended use case is a single fixed target, or a real-time experience.

For professionals who are used to working with static images, or to managing 3D pipelines that end with fixed renders, it's easy to picture the use cases for those static targets, because they align almost exactly with the use cases for real photography. Everywhere a traditional photo might be used, a pre-rendered image can be deployed instead, with tangible benefits to speed, flexibility, and other metrics that have made this the preferred approach for accurate, scalable, semi-flexible content creation in other industries. From demonstrating product concepts to merchandising teams to populating online marketplaces and out-of-home-billboards, a high-quality pre-render can not just stand in, for but improve upon real photography.

But precisely *because* the use cases for static renders are so predictable and well-defined, there is little possibility space left for fashion (or other industries) to explore with the 3D-to-2D format, even if the tools involved in creating the end results are still developing. Once a 3D scene has been carefully staged, lit, and a view of it

rendered - outside of alternate angles, material swaps, or shifts in lighting and composition that are, themselves, then stepped down from 3D to 2D, the potential of that scene to accomplish anything fundamentally new has been all but exhausted.

While the workflows, the tools, and the artistry behind computer-generated images are inspiring, at the point it's consumed, a picture is a picture - no matter whether the camera that took it was physically real, or whether it existed in the viewport of the Unreal Engine Editor.

The diametric opposite is true for real-time, where the potential use cases are vast enough to be difficult to predict here and now, and limitless enough to mark them as instantly valuable for a fashion industry that's now ready to substantially extend the value of 3D assets.

Rendered in real-time, a single 3D object, a complex scene, or even an interactive experience incorporating game logic, can all be used for a broad range of different applications - from showcasing product concepts in more tangible ways to internal teams, to allowing buyers to personalise and configure products, to placing those products into entirely new media channels and IPs.

And crucially, while the switch from pre-rendered 3D to real-time does require some compromises in fidelity at the point of experience, the two different deployment methods make use of the same core meshes, materials, and other elements - and those visual compromises can be made with purpose and care, so that they fit the intended use case and become difficult for all but the most discerning people in the intended audiences to notice.

Generated in Twinmotion

Until fairly recently, the primary reins that needed to be placed on the wide-open possibility of real-time 3D came from the requirement for those deployables to run locally, on the device where they were being seen and interacted with.

For example: displaying a pre-rendered image of a cliffside living room, with a collection of mountain sports products carefully staged in front of the vistas, requires nothing more than the local compute and graphics processing capability needed to show any other JPEG or PNG file. This lightweight demand would not change, no matter how complex the path tracing required to deliver the realistic lighting in the final pixels, because those pixels are just dots in a static image. Again, a picture is a picture.

Running the same scene in real-time, though, would have significantly higher local hardware requirements that would also scale with the resolution and quality settings needed to deliver the target result. Making real-time look good has long been a computationally intensive affair, and one that has represented its own technological evolutionary path, which has run across software (smarter ways to make real-time scenes look better without a constant influx of new cutting-edge graphics and computer hardware) and hardware itself.

As inventive as real-time engine builders are, that balancing act has so far put high-end real-time experiences out of the hands of users on mobile devices, laptops with integrated graphics hardware, and non-enthusiast desktop PCs.

Two different technology tracks have now changed this equation.

AI supersamplers running on local hardware (including DLSS4 with frame generation, which was added to Twinmotion in early 2025) can use machine learning to increase the perceived resolution and framerate of real-time rendering, lowering the hardware requirement for top-flight visual output.

And "Pixel Streaming" can shift the load completely away from end users' phones or laptops, with all the intensive rendering being performed in the cloud, while a video stream is sent down to the consumer's device and their inputs are sent back up - all with minimal latency, and with increasing numbers of concurrent users.

Readers who have interacted with higher-end configurators in the automotive industry will have experienced Pixel Streaming for themselves, whether they realised it or not. The car (or any other product type, since the principles are sector-agnostic) looks terrific on your device, but the heavy lifting is being done elsewhere. And this same technique is behind many of the different deployment methods available to industries like fashion through Twinmotion Cloud, which enables scenes to be published as interactive full-HD presentations, with full freedom of movement, or even VR experiences - all of which target users can access by clicking a hyperlink or scanning a QR code.

With this publishing problem in the process of being resolved, and the gap in fidelity between the two approaches to 3D rendering closing faster than even the most optimistic predictions, 3D in fashion is now on a clearer trajectory - one where use cases for pre-rendered 3D are well-defined and proven, but also one where the possibilities of real-time at the toolset and experience levels are both potentially expansive, explosive, and suddenly within reach of a massively wider audience.

WHY THE BIGGEST ENTERTAINMENT PLATFORM IS JUST PART OF THE PICTURE:

Any discussion of real-time rendering engines and experiences can be traced back to a decades-old root: video games. After all, the push to improve what computers are capable of visually bringing to life is anchored in the drive to give people agency within those visualisations. From ASCII art and text prompts to AAA cinematic blockbusters and arena-filling eSports, the frontiers of what we can display have always been pushed back at roughly the same rate as our ability to interact with it, and the twin communities of creators and players have similarly scaled alongside one another.

For fashion's purposes, though, the key realisation is that, as the video game industry has continued to push the possibilities of graphics and gameplay (we'll return to community in a moment), other industries have become the beneficiaries of the leaps made in rendering and interactivity.

Architectural visualisation, once the sole domain of technical CAD packages, now makes extensive use of the same underlying real-time engine and human interaction systems as the highest-profile games. But here professionals put them to work in service of experimenting with ideas, elevating presentations, and immersing their clients and prospects in the earliest stages of projects, before ground is broken, in a way that supports decision-making, alignment, and buy-in with new levels of confidence and clarity.
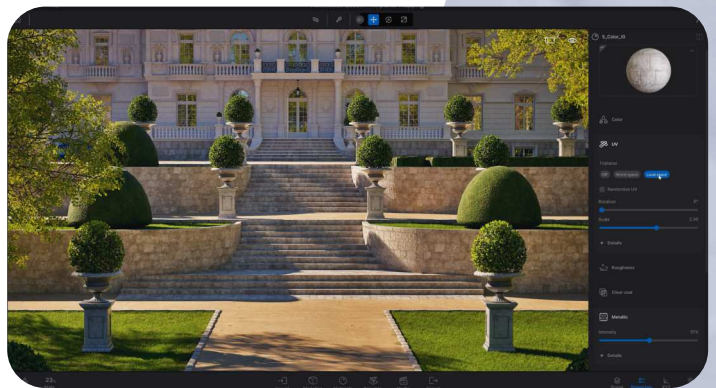
Images generated in Twinmotion

It's not difficult to see how the same principles will translate to fashion, where ideation, experimentation, internal and external presentations, and engagement with buyers and retail partners are some of the most vital stages of the typical product lifecycle, with pronounced impacts on product outcomes.

In the film and TV industries, the combination of real-time rendering with large-format LED displays set up within indoor sound stages (referred to as "volumes"), live performance capture, and the ability to manipulate and adjust film-quality assets and virtual sets on the fly has fundamentally changed how production teams approach the relationship between shooting footage and working with visual effects: two stages of a workflow typically separated by time that are now being brought together.

Again, there is a visible and fairly straight line between the virtual production setups employed by the media industry and the bottlenecks fashion faces in photography, videography, and content production. Starting with early design visualisation for a campaign photoshoot, real-time 3D has the potential to scale to a flexible setup that's capable of standing in for multiple different locations in a single day, with teams having full control over weather conditions and lighting, with no need to book over-subscribed locations or attempt to shut down busy intersections to capture a city scene.

And although there might not be much on the surface that links in-car infotainment systems and VR configurators with fashion's real workflows and challenges, the fundamental principle of having a single 3D backbone that runs from the creation of a product, through the product and the target user themselves, and into transformative experiences architected on top of the product, is one that plenty of businesses in fashion would love to adopt.

Behind all of these (and other) use cases from non-fashion sectors is the realisation that real-time rendering can, with the right artistic and technical talent in place, look more than good enough to meet the needs of senior professionals signing off on large-scale physical projects, discerning audiences who set an incredibly high bar for visual effects in movies, and - by extension - the people creating or buying clothing, footwear, and accessories.

The level of fidelity achievable in real-time is also something that's especially striking for professionals outside industries like VFX and video games, who don't directly engage with those sectors inside of work (or as hobbies), and whose impressions of games in particular are perhaps a little bit behind the times as a result.

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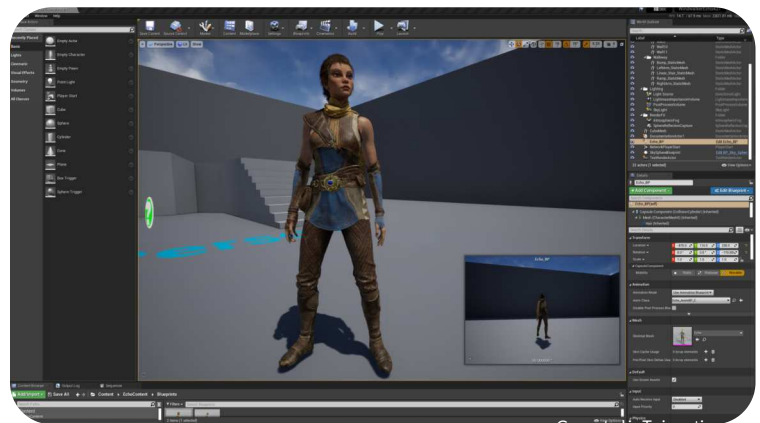
But as a matter of fact, in most markets people who don't engage with video games are now the minority. As well as being the standard-bearer for advances in real-time graphics, the video game industry is a behemoth in its own right: worth close to $60 billion in the USA alone, more than $10 billion in the UK, and a further $80+ billion in Asia-Pacific markets. And around 80% of the total online population engages with video games today, making it a hyper-popular medium amongst the prime target demographics for fashion: a diverse, inclusive cohort of people with an average age, in 2024, of 36. Teenagers with minimal spending power these are not.

That sheer size and demographic alignment are also the reasons that storied fashion brands - especially in luxury - have spent the last few years testing the perimeters and the possibilities of not just borrowing best practices and technologies from that industry, but approaching it as a gigantic and largely green-field media channel in its own right. In fashion and consumer products boardrooms worldwide, the mostly untapped potential of partnering with leading video game properties as the thin edge of a wedge that could become a fully fledged, digital-only business unit has been a hot topic for some time.

But that topic has also been, in some ways, a difficult one for the fashion industry to reconcile. The possibilities presented by real-time rendering as a class of technology solutions, and the potential to market and sell through the games and worlds that run on those engines, can either become conflated, muddying the way the returns are defined, or wind up competing with one another for investment.

If games are such big business in their own right, the argument goes, should fashion not focus its real-time efforts there - where brands can sell low-overhead, high-margin digital items to players - rather than on translating technology principles and processes from a different industry into their own internal workflows, where the digital transformation of design and development processes is already underway?

In practice, though, this is already proving to be a false distinction. Because the same 3D asset creation pipelines, processes, and people can work towards both ambitions at the same time, and framing them as competing priorities risks ignoring just how interlinked they are.

As a case in point: already, some of the world's largest brands, with mature DPC capabilities already in place across product sampling, design, and development, have tested and validated the value of making virtual versions of their products available to buy within the most popular games. Nike, for example, in partnership with Epic Games, debuted a new category of wearable digital products within Fortnite - which began life as a successful 'battle royale' game before growing to become a live service platform and full-scale content ecosystem with hundreds of millions of players - towards the end of 2024, effectively bringing together a strategic vision for 3D as the future mode for product creation and 3D assets and partnerships as a new revenue stream.

And Reebok has arrived at a similar endpoint from a different angle, making use of Epic's newly-interoperable MetaHumans (which are covered in more detail a little deeper into this roadmap) to offer unique products that can be easily integrated into games, experiences, and other creator projects that run on Unreal Engine, seamlessly fitting MetaHuman characters and creating a through-line for a brand built on physical products to also offer what it refers to as an "instant digital flex".

The use of the word "metaverse" may have declined, but the central principle behind that hype cycle has now come closer to being realised through video games - especially cross-media melting pots and global cultural mirrors like Fortnite - than people realise. Today, millions of fashion's target audience members are actively sharing live experiences, concerts, and other events in virtual worlds, and the world's largest brands have mounted unique activations in-engine and in-universe to reach them with messaging and digital-only products.

Similarly, high-fashion labels have also worked with both Fortnite and Unreal Engine - the real-time rendering and game engine behind it - to engage both new and existing shoppers, to help create full-scale global ad campaigns, and to sell digital items that both embody their brand aesthetic and that ideally serve as gateways into real fashions that consumers can obtain physical versions of.

And initial metrics appear to bear out the success of these "brand world" and digital item initiatives when compared to campaigns, activations, and collaborations in other media verticals; evidence suggests that engagement, dwell times, and similar benchmarks can be multiples higher in real-time worlds than those achieved through social channels.

But even if these strategies continue to grow at the ideal pace, they are still likely to represent just a narrow slice of the spectrum of what could be possible if fashion is able to expand its purview to look beyond sales and marketing, and towards turnkey tools and solutions that have the potential to become pillars of a fundamentally different way of working, rather than just a new frontier for advertising.

They are, in essence, a slice of the real-time vision, but certainly not the whole.

For instance: as compelling as the business opportunity to sell digital goods might be, and as large as the video game market is, those opportunities are currently dwarfed by the multi-trillion-dollar business of making and selling physical apparel, footwear, accessories, and cosmetics, and the value associated with making that business more cost, time, material, and go-to-market efficient, is therefore much greater as well.

As a consequence, the key strategic opportunity for real-time 3D, at the tool and ecosystem level, is to streamline and transform everything about the way those products are designed, developed, produced, marketed, and experienced.

As we've already hinted at, though, there is no binary choice that has to be made between these two options. Clearly different business strategies will place differing amounts of emphasis on one set of possibilities or the other, but because real-time 3D underpins them both, building competencies in creating digital experiences and end products will elevate skills and evolve toolsets in the use of real-time to streamline the creation of physical products - and vice versa.

Image courtesy of BODS

So while fashion has, for some time now, been a little preoccupied with the opportunities for promotion, licensing, and the sale of digital-only (or hybrid "phygital") products in games, The Interline and Epic Games jointly believe that an even larger reservoir of business value will be obtained from real-time 3D based on how successfully, and at what scale, it can be integrated into the vision for a second wave of digital product creation, and a wider horizon for digital transformation as a result.

As Pierre Maheut from Adobe puts it, building excellence in digital asset creation, and putting in place the right platforms to visualise, share, and experience those assets has the potential to help brands recognise, challenge, and overhaul the entire business of designing, development, making, and marketing fashion at the same time as opening up new frontiers in engagement.

"With the rise of 3D Digital Twins, nearly every object can now exist in an interactive, hyper-realistic virtual space—opening the door to a radically new way of engaging customers," he told us. "Beyond just purchasing a product, consumers can now embark on a journey of creativity, storytelling, and brand immersion, forging deeper emotional connections that last far beyond the transaction. In this new era, fashion isn't just something you wear—it's something you live."

Giving a specific example, Pierre adds: "Imagine slipping into a shirt from a famous luxury brand, and instantly stepping into an immersive Vision Pro regatta experience at the America's Cup, feeling the wind and waves as if you were part of the race. Or buying a pair of sneakers and unlocking an exclusive virtual interview with a sporting legend, where they share personal insights and inspiration. This next-gen engagement transforms how brands interact with their audience, shifting from passive consumption to active, high-emotion experiences. Team sports activations, live events, and gamified storytelling all become powerful touchpoints, reinforcing brand values and deepening customer loyalty."

For fashion, then, real-time 3D has picked up a strong association with video games, digital fashion, and other non-traditional channels, but its most essential, strategic role - and the one where it's likely to deliver the biggest return on time and talent invested - will be as a pivotal piece of the evolving digital product creation toolkit.

Image courtesy of Gary James McQueen

THE SECOND WAVE, INTEGRATIONS, AND THE AI QUESTION

And that DPC toolkit truly is evolving. Even without the addition of real-time rendering, the digital product creation technology market has been anything but static. New hardware, software and services for material digitisation, new strides being taken in inclusive, soft-body avatars for sizing and fit, smart asset management platforms for distributing 3D content across different endpoints, and much more have all seen marked upgrades recently.

From the core desire for creative and technical teams to be able to create the most complete, accurate, and usable digital representations of real garments, footwear, and accessories, the first wave of 3D in fashion has already given rise to a vibrant ecosystem of tools, applications, and even infrastructure - all designed to embed digital product creation even more deeply into all-round digital transformation.

This steady accretion of new tools, new integrations, new companies, and new ideas has also been responsible for many of the key milestones that fashion brands and their partners have passed in the last few years.

But there still remains a noticeable distance for traditional 3D strategies to travel to meet the wider vision for digital transformation. And the most forward-thinking organisations are already evaluating the next steps, and almost universally finding that their vision for what a second wave DPC should be capable of will require them to realign their strategic business priorities, update their 3D technology stack, and expand the skillsets they have access to in-house and through partnerships.

As tall an order as all this sounds, though, there is already tangible ambition industry-wide to tackle it. Based on three years' worth of research in The Interline's 2022, 2023, and 2024 DPC Reports, we can conclude that 3D as a software category has continued to draw investment in software and talent that at least equals the capital and operational expenditure secured for other key enterprise software segments like PLM.

And the brands and manufacturers who committed in the deepest ways to DPC are visibly continuing to build on those investments. And with those companies serving as lighthouses for what's possible, it's no surprise that, based on the same dataset from The Interline and Fashion by Informa, 90% of fashion professionals (the majority of whom already have 3D / DPC strategies underway) also believe that 3D / DPC will create additional value throughout 2025 and into 2026.

That survey did not ask where - process area by process area - industry professionals believe that value will be created, but at a whole-industry level this is something we can observe from the differing maturity levels of existing DPC use cases, and the process gaps this unequal distribution has left behind.

THE STEADY ACCRETION OF NEW TOOLS, NEW INTEGRATIONS, NEW COMPANIES, AND NEW IDEAS HAS BEEN RESPONSIBLE FOR MANY OF THE KEY MILESTONES THAT FASHION BRANDS AND THEIR PARTNERS HAVE PASSED IN THE LAST FEW YEARS.

On aggregate, fashion has made significant headway with using 3D to simulate and engineer 2D patterns, to stand in for physical prototypes and samples in internal and partner-facing communications, and to replace static product photography for eCommerce catalogues. By contrast, other use cases that are, today, technically achievable (such as fully virtualised costing of materials and operations, or complete material and component digitisation) have not seen the same level of progress.

Overall, DPC strategies have understandably over-indexed on areas with the greatest short-term return (especially during the COVID pandemic, when 3D sampling and content creation took on a heightened importance), but that this prioritisation has come at the expense of other use cases where the value is perhaps harder to identify.

This is a balance that real-time 3D, if it truly comes to define the next wave of digital product creation, will be asked to redress through its ability to connect, integrate, and unify different workflows and systems, and to provide an uplift across them all that has historically fallen outside the grasp of some teams using traditional 3D tools and pipelines.

"The tools themselves are super powerful, and [today] teams mostly only use a fraction of that power," says Dominic Sluiter, Co-Founder of automation and digital integration company EnhanceThat. "There is so much more value to get out of existing tools by looking at them as parts of a workflow. In many cases fashion [currently] has tools that could behave like 'race cars', but the industry chooses to drive them on country roads rather than racetracks, because building those 'racetracks' would require connecting 3D tools with [systems like] PLM, DAM, presentation, and assortment planning systems, rendering engines and much more."

In Sluiter's extensive experience, this barrier between well-established but narrow use cases for 3D and wider and deeper opportunities is not something that can be easily ascribed to either talent or software, but rather a mindset shift that simply hasn't taken place.

"In our experience with our clients we observe skillful teams with lots of passion, lots of motivation, and access to a pretty good suite of tools," he adds. "But almost always there are still opportunities [left] in scaling high-quality, consistent product visualisations, boosting adoption across teams - from design to merchandising, marketing, and eCommerce - and providing seamless product consultancy, from initial concept to consumer-facing assets."

In practice, at least some of this potential could still be achieved within the confines of existing digital product creation strategies and structures, but the wider opportunities of adoption, integration, and alignment between what's possible with tools and what teams can practically achieve with them, are continuing to prove elusive for many brands.

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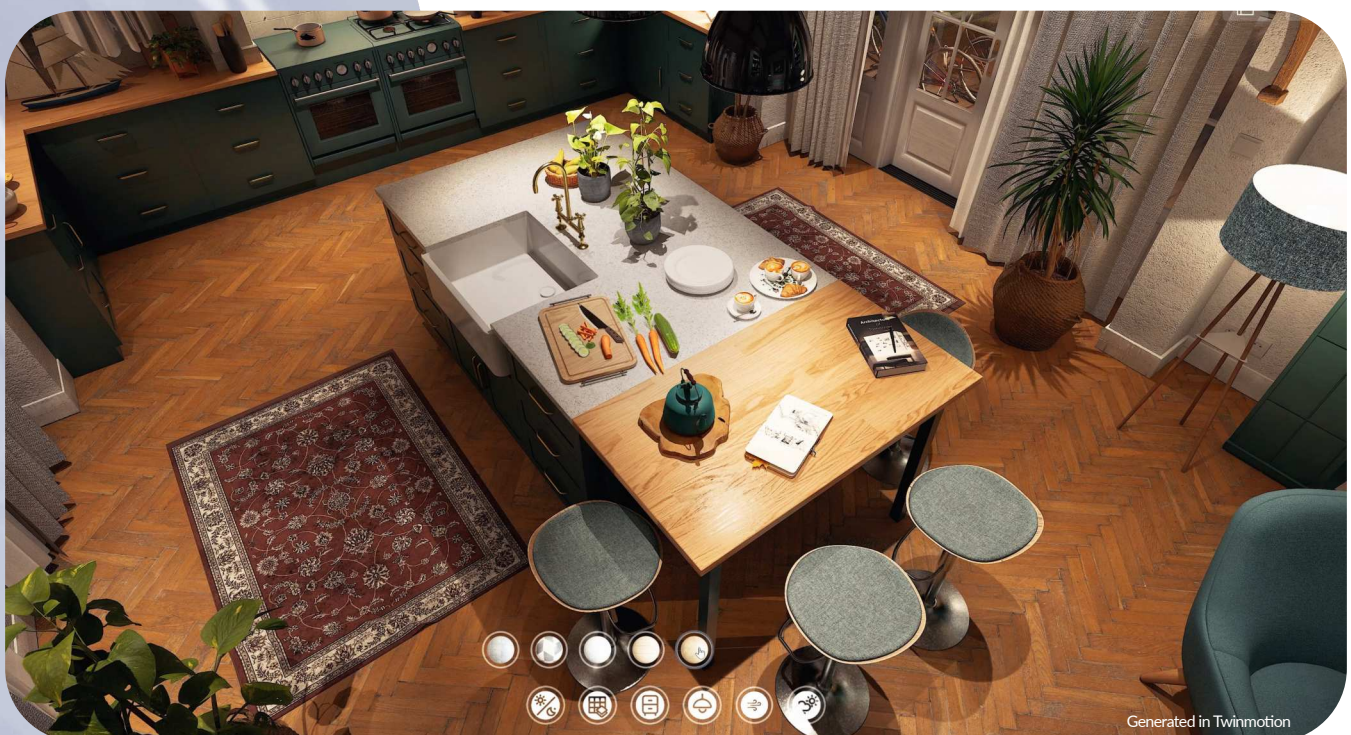
This slightly overdue shift is now also potentially running into a separate technology category that also promises to positively impact integrations between systems, workflows, and automation. As vital and viable as the 3D technology sector remains in fashion, there is every chance that a significant influx of investment in artificial intelligence will set a new high watermark for business technology spending in 2025 - and this raises the associated concern that these budgets will be reallocated from other technology categories where those enterprise-wide results have been harder to come by.

Already, though, we are beginning to see AI and DPC complementing one another, rather than wrestling budget from one category to another - even if that integration is something that must be sensitively managed. Whether it's using AI to develop initial concepts ahead of creating 3D models, or deploying generative AI to optimise the photorealism and the look of final offline renders, there are increasingly visible areas where the two are intersecting.

In-industry, however, there are still concerns about how the roll-out of AI will affect creative disciplines, and while some brands have forged ahead with employing AI in service of product design and marketing, others are quietly undergoing periods of internal interrogation and introspection.

So, for an engine developer and a custodian of de facto 3D asset marketplaces like Epic Games, the key to recognising the potential value and the cultural sensitivity of that blend of AI and 3D lies in allowing creative communities to make their own choices. The company's Fab marketplace permits creators to add content that incorporates AI-generated elements, but these must be clearly tagged - and there is a commitment that no works added to any asset libraries will be used for training future AI models.

At the same time, though, Epic (like essentially all digital creator tools and suites) has already begun to take a studied approach to incorporating AI into their own tooling, so that professionals working in Unreal Engine or Twinmotion will benefit from usability enhancements, efficiency improvements, and a smoother pathway to the creation of next-generation experiences.

This attitude is also emblematic of how the creators of some of the world's leading 3D and DPC tools are thinking about the potential crossover between AI and 3D, and where the more tangible, safe, and scalable impacts will be felt.

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Generated in Twinmotion

"Smarter automation, AI-powered workflows, hyper-realistic simulation, and secure, scalable infrastructure will [be what] defines the next era of 3D creation and simulation," Kiele Lowe, VP of Product at digital apparel design and development software provider Browzwear told The Interline. "Generative and predictive AI will handle the repetitive work - auto-rigging complex meshes, inferring material behaviors from a single image, and proposing physics-accurate drape or deformation in real time. As simulation engines ingest ever-larger training sets - garment scans, motion-capture libraries, photometric references - visual fidelity will cross the threshold where digital and physical twins become virtually indistinguishable, even under extreme lighting or motion."

But the same technology figures are also clear-headed about where the line should be drawn between streamlining and automation of fashion workflows through technology alone, and a more virtuous and viable relationship between software and people.

"Breakthrough technology alone isn't enough," Kiele Lowe carries on. "The real winners will be the [companies] that embed these advancements into secure, user-centric workflows. Protecting creative assets through watermarking, rights-managed collaboration spaces, and traceable file lineage will be the baseline, ensuring designers can share freely without losing control of their IP. [...] By combining automation, true-to-life simulation, secure pipelines, and collaborative expertise, [fashion isn't] just preparing for the next wave of 3D innovation, we're actively stitching it together."

This steady stitching of previously discrete, disconnected elements into a fuller enterprise transformation may sound like a philosophical statement, but it's one that is already beginning to influence how brands are approaching 3D and DPC strategies. Companies are now beginning with the mandate that 3D should be an integral part of both their technology stack and their cultural setup, and seeking solutions and workflows that frame DPC as a driver for interoperability, and intelligent decision-making.

COMPANIES ARE NOW BEGINNING WITH THE MANDATE THAT 3D SHOULD BE AN INTEGRAL PART OF BOTH THEIR TECHNOLOGY STACK AND THEIR CULTURAL SETUP
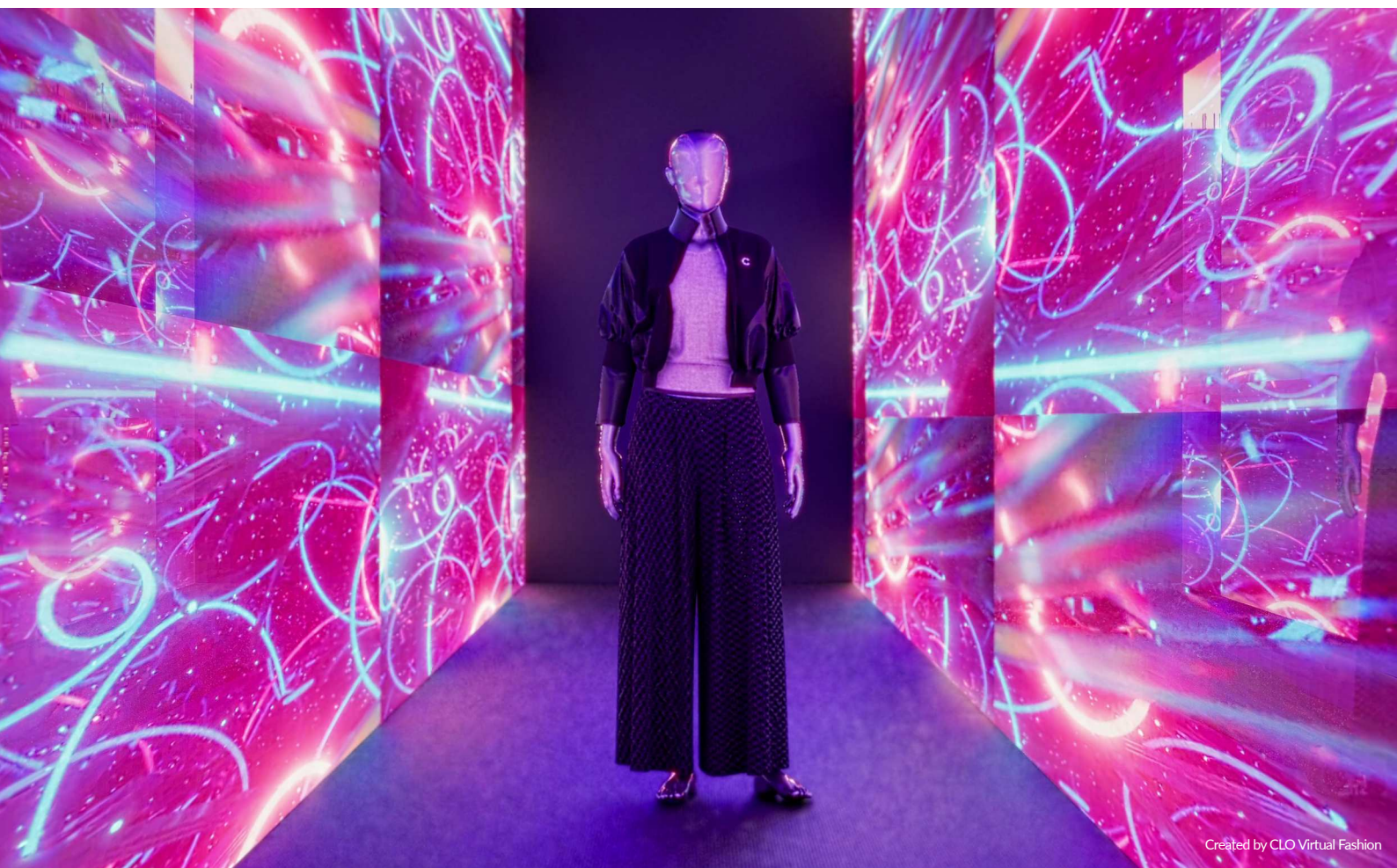
And the same companies now see the integration between 3D tools and the full transformation ecosystem as being essential if fashion is to realise the full potential of this second wave of 3D.

"To fully integrate 3D technology into fashion's end-to-end workflow, it must also connect with ERP (Enterprise Resource Planning), PLM (Product Lifecycle Management), and other enterprise systems used by fashion companies," says Jaden Oh of CLO Virtual Fashion. "This level of integration ensures that 3D assets are not just design tools but also key components in planning, development, production, and distribution. Compared to industries like gaming or film, where 3D models exist primarily for digital consumption, fashion's reliance on real-world manufacturability makes the adoption of 3D significantly more complex."

"Ultimately," Oh says, "fashion's 3D pipeline is not just about creating visually realistic assets—it requires a deep level of integration with business operations and production systems, making it one of the most intricate and demanding applications of 3D technology today."

This is the environment into which real-time 3D now needs to slot - one where flexibility is just as important as fidelity. As much as user buy-in for real-time 3D will hinge on the quality of the output it produces, the expectation will also be for a single asset to be able to serve as a frame of reference for intelligent decision-making across the extended product journey. The same asset or scene will need to be capable of communicating both subjective and objective stories, with as little fragmentation between them as possible.

"The major concern [today] remains interoperability," says Bhargava Ram Kummamuru, Head of Digital Product Creation at global fashion giant H&M Group. "Design and pattern are still interconnected entities in the DPC space. We have software that either focuses on easy pattern creation with the best visuals, or the other way around. Unlike other industries, fashion is often about speed and scale; this necessitates an easy translation of a concept into a product." "

In practice, this focus on speed and scale have made it difficult for existing digital product creation strategies to simply shorten time to market, because that route between concept to digital product relies on different solutions and different stakeholders sharing a single vision. . For some brands, the scaling-up of 3D asset creation has translated into great alignment between internal teams and external partners, and vastly increased availability of visual content - but the ongoing need to still create physical samples for different purposes, and the requirement to convert 3D assets and scenes into 2D images in order to share them with colleagues and peers, has challenged the idea that digital product creation, as a blanket strategy, would automatically reduce time to market.

Real-time 3D, though, has the potential to revitalise this idea, by using a single asset as the pivot point around which creation, communication, collaboration, and decision-making orbit. And as Amir Mohammed, the Head of Department for Design at Interloop Limited - a leading upstream partner for some of the world's biggest brands - explains, "The biggest challenge facing the fashion industry, when it comes to 3D, is the creation and acceptance of digital standards."

"Many different suppliers, stakeholders, and actors in the global value chain can create and share digital assets," Amir continues, "but without a common framework that determines how these assets should behave, what they should contain, and their interoperability, it [has been] difficult to reach a level of trust where brands and their partners can truly collaborate and make decisions in 3D."

"I think that same push is behind the shift towards real-time 3D, as a way of aligning different people to a common vision, and giving each of them the tools to experience that vision, interact with it, and make choices based on it in a 3D-native way," he concludes. "If these pieces can fit together, then we will truly have reached a new era of digital product creation."

PIPELINES AND PEOPLE FIT FOR FASHION'S FUTURE

For most of fashion's journey towards the original end goal for digital product creation, the industry's vision has been to empower in-house brand communities and a close cohort of partners to make mission-critical decisions based on 3D assets. But practically speaking, as essential as these choices are for creating positive product outcomes, they are still just a tranche of a much wider go-to-market and retail decision-making spectrum that extends to essentially everyone who influences or is impacted by actions across the extended product lifecycle.

And within that extended spectrum, there are perhaps few priorities as pressing in the current climate as identifying and implementing new methods to capture, captivate, and convert consumers. With every sale hard-won, every margin target under threat, and nearly every domestic market being transformed by digital-native disruptors, equipping consumers with the right content and experiences to make informed choices could have a potentially even larger impact than the decisions being made upstream - even if the same technology foundation sits underneath them both.

This is also more than just an academic exercise. With more consumers moving away from traditional media and towards new models of product discovery and digital selling (not least with AI increasingly mediating the search and discovery process), a brand's ability to build more meaningful, more interactive product and brand experiences is a strategic and commercial priority, not simply a creative test case.

Or, to put it more simply, exposing consumers to 3D assets and engaging them in real-time experiences has never been more important than it is today.

But as a section of the current DPC pipeline, industry engagement with, and maturity in and around, the capabilities needed to create these kinds of experiences is relatively low.

"Fashion has made steady, if unspectacular, progress in leveraging 3D for design visualisation, prototyping, and virtual sampling," Matthew Drinkwater, Head of Innovation at the Agency at the London College of Fashion, explains. "There is certainly more scope for pushing boundaries in reducing waste and enhancing efficiency," he adds. "However, compared to industries like gaming and entertainment, where real-time 3D has been embedded seamlessly into consumer-facing experiences, fashion is still playing catch-up. The potential for fully interactive real-time environments in retail and brand storytelling remains largely untapped, leaving fashion behind in harnessing 3D for dynamic, consumer-centric engagement."

What will it actually look like, though, for fashion to bridge that capability gap? How should a pipeline and a culture set up to turn the potential of real-time 3D into actionable, whole-enterprise engines for decision-making be architected? How should it operate? And is fashion really prepared to build it?

Evaluated through this rubric, the apparel and footwear sectors being a little behind the frontlines set by other industries could actually prove to be an advantage. Unlike other sectors, which needed to build out the toolchains at the same time as making use of them, fashion has the opportunity to inherit and convert best practices, pipelines, and proven ideas from other markets and adapt them to its own advantage.

On that basis, the industry is starting from a much higher floor than sectors like automotive and VFX were able to; there is simply more of the pipeline already in place today, and fashion brands are able to begin building their real-time workflows without needing to lay the common foundations first.

"The 3D asset and environment creation pipeline has become relatively streamlined across many industries, thanks to the standardisation of tools like Blender, Maya, Unreal Engine, and CAD software," Jaden Oh, Co-Founder of CLO tells us. "[In those mature sectors] compatibility, asset optimisation, and real-time rendering have significantly improved over time, allowing seamless transitions between different platforms."

But while new capabilities in core 3D challenges like the real-time behaviour of light, for instance, quickly benefit all industries that operate on top of tools like Twinmotion and Unreal Engine, for real-time tools to achieve their potential in fashion, they will also need to cater for the many different, industry-specific storytelling and decision-making criteria that make fashion more of an edge case.

"Fashion [...] faces unique challenges because 3D technology is directly tied to real-world garment production," Jason Oh from CLO explains. "Unlike industries like film or gaming, where 3D models are primarily used for visual representation, digital garments in fashion must be exceptionally accurate in both appearance and physical behaviour—including properties like drape, weight, and elasticity. This level of precision is crucial because 3D garments often replace physical samples, reducing material waste and streamlining production."

"Every component of a garment—fabric, zippers, buttons, trims, and other materials—must be digitised with complete accuracy, as they are the same components used in physical manufacturing," he adds. "This digitisation must include not only visual properties but also physical attributes, types, costs, supplier details, and other metadata essential for real-world production."

This broad scope is a reminder of how many different subjective and objective criteria combine to determine whether or not a product is a success - many of which have no direct analogue in other industries.

"Compared to other industries transitioning to 3D, fashion faces a more complex journey, particularly in apparel," adds Kiele Lowe from Browzwear. "While many sectors work with standardised shapes and dimensions, apparel must account for the diversity of body types, fabrics, and construction techniques. In this context, 3D is not just a visualisation tool. It's essential for validating the accuracy of digital fit. Ensuring a garment fits as intended in the virtual space helps brands reduce physical samples, improve product quality, and dramatically lower return rates. This level of precision drives efficiency and supports better decision-making throughout the product development cycle [...] bridging the gap between digital design and real-world manufacturing."

Image Courtesy of Gary James McQueen

For a wider audience of fashion professionals to build trust in digital assets as tools capable of validating fit, cost, material composition, and other essentials, this requirement to anchor 3D assets (whether they are experienced as static renders or in real-time environments) in real, producible components, patterns, and specifications must also be the cornerstone of any fundamental change to the landscape of digital product creation.

For the industry to effectively tell stories to both in-house and external audiences, those narratives must be grounded in the realities of the products themselves. And in practice this means that any successful 3D pipeline must be connected to the systems where data and assets that are critical to the product reside.

"A boundary many brands in the industry have encountered is the connectivity of our digital tools," explains Kayla Woehr from New Balance. "It's becoming essential for 3D tools at the minimum to connect to PLM and DAM systems to reduce duplicity in workflow and to add value to time spent in 3D tools. I wouldn't call [this] a limit, but a hurdle many are trying to overcome, and something I know more robust solutions will be available for in the future than what exists today."

The goal of real-time 3D tools should, therefore, be to create not just visualisations of products, but real representations of them that combine aesthetics, pattern-accurate simulation, and open-ended utility into a single non-destructive, end-to-end pipeline that runs from initial experimentation right through to the creation of photo-real showcases and onto the soundstages of virtual production.

The same pipeline will also need to cater to both the full scope of product categories that fashion brands can cover - from intimates to eyewear - and the ever-expanding roster of roles and people who will need to interact with those products.

Because, while traditional 3D skills have become more widespread as software like CLO and Browzwear have become bigger fixtures in institutional education, vendor onboarding programmes and communities, and self-teaching, there has remained a cap on the number of fashion professionals who saw value in acquiring 3D skills while the options to use those skills were relatively constrained.

But as interacting with 3D objects, scenes, and experiences becomes a bigger fixture in a broader range of different fashion jobs - from merchandising to marketing - the number and the diversity of different end users for real-time tools and experiences has the potential to grow dramatically.

And at the same time, those more diverse roles and individuals will also come to exert more control over how digital product creation strategies develop - a responsibility that has so far been picked up by 3D artists, DPC specialists, and their technology partners.

"To truly streamline 3D, brands need to match the right tools to the right teams," says Ryan Howell from M-XR. "A designer's workflow looks different from what marketing, operations, or sales need; however, there is some overlap that can be managed. In my view, representing a brand's craft accurately will always be a priority, so using capture techniques to create true-to-life digital twins is essential. Once that base asset is created, it's up to the creative teams to build experiences that inspire customers, partners, or internal teams."

This anticipated explosion of 3D users will, though, require an influx of new professionals in both core and extended 3D disciplines, and in that respect fashion is currently facing greater demand than supply.

"The demand for digital talent is expanding across the board," Matthew Drinkwater from the Fashion Innovation Agency told us. "While the initial focus has been on design and product development—enabling faster prototyping and virtual sampling—brands are now realising the need for digital expertise in marketing, e-commerce, and consumer engagement. As immersive retail and interactive storytelling become more prevalent, the ability to translate 3D assets into engaging digital experiences is becoming an increasingly sought-after skill."

THIS ANTICIPATED EXPLOSION OF 3D USERS WILL, THOUGH, REQUIRE AN INFLUX OF NEW PROFESSIONALS IN BOTH CORE AND EXTENDED 3D DISCIPLINES, AND IN THAT RESPECT FASHION IS CURRENTLY FACING GREATER DEMAND THAN SUPPLY

Crucially, though, for all but dedicated 3D artists and technical professionals, it will also need to be a supplemental skill. Just as the right real-time 3D pipeline must take into account all of the different attributes and elements of the physical product and the person wearing it, the fashion professionals of the near future will also need to blend appropriate 3D skills with traditional talents to create the hybrid skillsets the industry now needs.

"I truly believe that the future belongs to those who can blend creative storytelling with technical expertise," as Matthew Drinkwater puts it. "The next generation of fashion talent is overwhelmingly optimistic about the role of technology in shaping the industry's future. Many of our students at London College of Fashion see 3D, AI, and immersive technologies not just as tools but as avenues for greater creative expression, sustainability, and inclusivity. They are eager to push beyond traditional boundaries, and their ability to envision new possibilities in real-time environments gives me enormous confidence that they will drive transformative change in the years ahead."

But as optimistic as the outlook for the real-time talents of the next generation of fashion professionals is, there is also a significant pool of expertise that currently exists within the industry - and working groups and committees like the 3D Retail Coalition Education Committee are focusing their efforts on upskilling current talent across the global fashion value chain, to create that kind of hybrid expertise from existing in-house teams.

There is also a large role for companies - like Epic Games - developing the enabling technologies. At the same time that the fidelity and power of real-time tools have been increasing, the barrier to entry to using them effectively has been lowering. And just as existing 3D design, development, and simulation tools have paired institutional education with grassroots programmes, the sheer accessibility of tools like Twinmotion is already unlocking a wealth of opportunities for fashion professionals to develop new skills, while opening up pathways to the huge pool of real-time talent that exists in other sectors (including in the deeper reservoir that is the expert Unreal Engine community) to explore opportunities in fashion.

When fashion executives are considering the userbase for the real-time pipeline of the near future, though, it's important not to constrain our perspective. While the typical "user" of real-time tools that most people envisage will be a creative professional working within a brand's own team, the promise of real-time 3D is that the consumer market will be the end user for a lot of 3D experiences.

And as tempting as it is to assume that this audience is already primed and waiting for new experiences, industry perspectives suggest that real-time 3D will likely need to be both phased in and taught, and carefully calibrated to ensure that it delivers what consumers are actually looking for across different channels.

"The big question with what's next in 3D is how the user community will grow, and who the eventual end user should be," says Cyrille Ancely, Digital Product Asset Manager for sporting goods giant Decathlon. "We, as an industry, are making real progress by providing core 3D creatives with tools that allow them to push their disciplines forward, and at the same time 3D has also empowered teams who would not traditionally work in 3D to approach their job in a different way. There are, today, terrific 3D designers working on modelling, texturing, and simulation, and there are also their colleagues in merchandising, for example, who are able to use 3D environments and assets to build virtual stores and to test things for themselves."

"What's not clear, at least for us, at this point" Ancely adds, "is how this community extends to the broader base of consumers. We know that shoppers like using augmented reality to visualise, say, gym equipment in their homes, or to visualise and configure a bike, but there is perhaps less of a use case for actually interacting with 3D for apparel, footwear, and other categories."

It will come as no surprise where Ancely currently draws the line on what constitutes an effective use of real-time 3D.

"For me, the key criteria is the ability to make a decision," he told us. "Today, designers and product creators, and their teammates, are making extensive use of 3D to make important choices about how products are made, how they're intended to be used, and how they communicate those elements to other people. For end consumers, right now, the assets they use to make buying decisions are photographs and video - whether those are shot with real products and real cameras, or whether they are rendered from 3D. This is an evolving frontier, and it's something that I think the industry will need to test and refine over time."

So, while there is every indication that fashion is more than ready for the next step in 3D, culturally and technically, it is also clear that successfully rolling out real-time tools and workflows will require the kind of continuous development and refinement that Ancely speaks about. And that ongoing progress is something that fashion organisations will need to actively focus on, rather than assuming that robust business cases will present themselves in our industry simply because they have in other sectors.

As instinctively promising as real-time 3D is, and as much as the next generation of creators and consumers are already excited its potential, that potential will need to be enumerated, demonstrated, and articulated for universal adoption to follow - and for trust and investment on the part of brands, retailers, suppliers, educators, and the industry at large to continue.

Image courtesy of Gary James McQueen

BUILDING TRUST IN DIGITAL HUMANS

As important as the people behind the keyboards and mice will be to the success of the next wave of digital product creation, trust in a 3D-native future will be difficult to build if all of that talent, investment, and tooling is concentrated solely on the product. Whether it's a sneaker, a shirt, a shoulderbag, a suit, or anything in between, the full value of an accurate, real-time instantiation of a product will only be realised if it can be paired with a digital person who is of a similarly high quality and just as extensible and usable across the full scope of the product journey.

This matters today, with a widening audience of professionals, end users, and consumers already need to interact with fashion digitally - and it will matter even more in the near future, when digital touchpoints become more common as the first (and in some cases only) interaction that people have with fashion, whether those touchpoints are in design, product development, marketing, or across a set of new marketing and sales channels. Fashion is intended to be worn, and for products to look their best (as defined for each individual use case) digital representations of fashion should be worn by digital humans that capture and enhance the character of those products.

To date, just as it has with DPC initiatives as a whole, a lot of time and effort has been expended on the areas of developing and extending digital humans that had the readiest returns, and that sat the closest to the core disciplines of product design and development. These avatars and forms have been focused towards technical use cases, prioritising sizing and fit accuracy across size ranges that reflect global or regional markets, with more recent developments concentrating on soft body avatars that are geared towards simulating the effect of compression and other variables on human bodies that are, after all, non-rigid.

From a workflow perspective, digital avatars are, as a result, well-integrated into the mechanics of digital design, patternmaking, garment engineering, and virtual sampling. But when it comes to how a given product's story is told across the extended audience that's likely to interact with the future of real-time 3D, those engineering-focused avatars can fall short in terms of fidelity and believability for non-technical users, and cross-channel and cross-application portability. This is creating a mandate for a more unified technology and framework that allows for a single character to be used throughout the product journey, upstream and down.

Digital avatars that focus on technical design and development have also not always been straightforward for users to create, pose, or animate - with limitations on both usability and expressiveness. Their accurate underpinnings have proven themselves time and again behind closed doors, but as the userbase for digital product creation continues to expand, that wider community is already beginning to request digital humans that look more believable and relatable, that can accurately reflect the way people talk, express themselves, and move beyond pre-canned walk cycles, and that reflect the real diversity of people that modern, inclusive brands need to cater to.

This is another area where fashion, industry-wide, is currently experimenting with AI, as a tool to improve the photorealism of final renders. But the aggregate perspective is that this is not likely to have a pronounced impact on the kind of consistency and repeatability that extended brand and retail audiences demand from the output of digital product creation processes and pipelines. And the uncertain provenance of some AI material, and the cultural backlash against the use of AI creative in traditional marketing channels, could complicate this avenue even further.

MetaHuman Creator
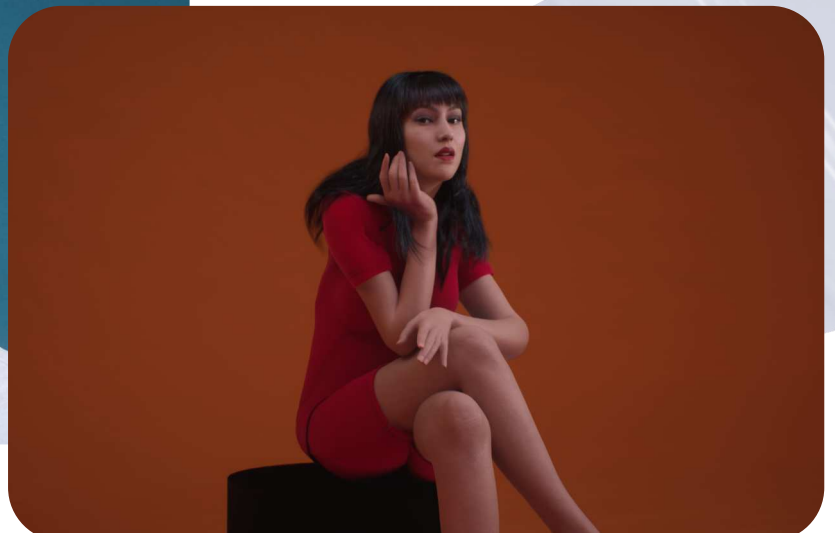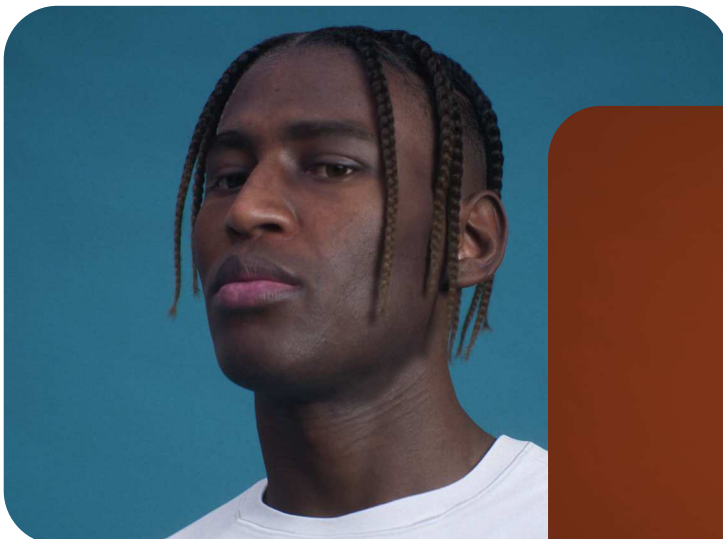
So this other foundational piece of the predicted future for real-time 3D - expressive, trustworthy, believable, and interoperable digital humans - is one that Epic Games have been working on for several years. And shortly before this report was released, in the summer of 2025, its MetaHuman framework and toolset left Early Access and became a fully fledged part of the real-time creative suite - enabling almost anyone to create and animate a completely bespoke digital human for use in real-time 3D projects, scenes, and experiences.

After being extensively refined, the MetaHuman framework is now positioned as a way to enable a wide cohort of users to push the boundaries of photorealism and emotional expressivity, at the same time as enabling the end results to travel to more places and pipelines, to be performance captured and animated in real time using consumer-grade hardware, and to incorporate clothing assets in entirely new ways.

All of this has seen MetaHuman use cases successfully deployed across a range of other industries, including TV, movies, videogames, broadcasts, and live concerts, and even becoming the faces for chatbots and digital assistants.

But it's the most recent developments that have made them particularly well suited to fashion. As well as now being integrated into popular DPC tools such as CLO, MetaHumans are now integrated into the Epic ecosystem, and have become a key part of Unreal Engine itself, after being constrained to primarily run on the cloud during the Early Access phase.

New to the framework this summer is a parametric body system that, as the name suggests, puts a wide set of adjustable parameters (all based on a large number of real-world body scans) at users' fingertips, enabling them to adjust and constrain measurements based on body data; set height, waist, leg length, and other key points of measure; and create plausible proportions that allow the virtual human to be used for eCommerce purposes, across a suite of internal and inter-departmental use cases, and in a range of scenarios in between.

As well as existing approaches to import clothing from 3D tools like CLO using the multi-industry USD standard, the framework now also includes the ability for users to author clothing and accessories in other DCC applications, and then assemble them into a unified Outfit Asset Unreal Engine - a format that can be used with any MetaHuman, automatically resizing against their body shapes. And those Outfit Assets can also be packaged and sold on the Fab marketplace, unlocking digital use cases like Reebok Impact, and allowing MetaHumans to become a canvas for new possibilities as well as a foundation for extending the storytelling potential and the impact of existing retail channels and media.

Recent enhancements to face textures and hair, designed to enhance photorealism and believability, are also opening up a space for makeup artists - using tools like V-Metics - to learn, experiment, and trial looks on realistic skin across a broad spectrum of different people, working with accurate digital twins of materials to design, develop, and refine beauty workflows the same way digital product creation has done for fashion.

Finally, MetaHumans now also exist under a new licensing structure, enabling them to be integrated into other engines and creative software, and streamlining the process of bringing them into new applications and experiences.

As the next wave of digital product creation continues to build, and as the extended audience continues to set new, higher bars for content, quality, and photorealism, digital humans are set to matter a great deal - alongside existing avatars, and Epic is a standard-bearer in what's set to become a key influence in the business case for real-time 3D. Digital humans, though, will not make that business case alone - which is why it will also be essential for fashion to consider the much wider possibility space when it comes to creating value from real-time.

MetaHuman Creator
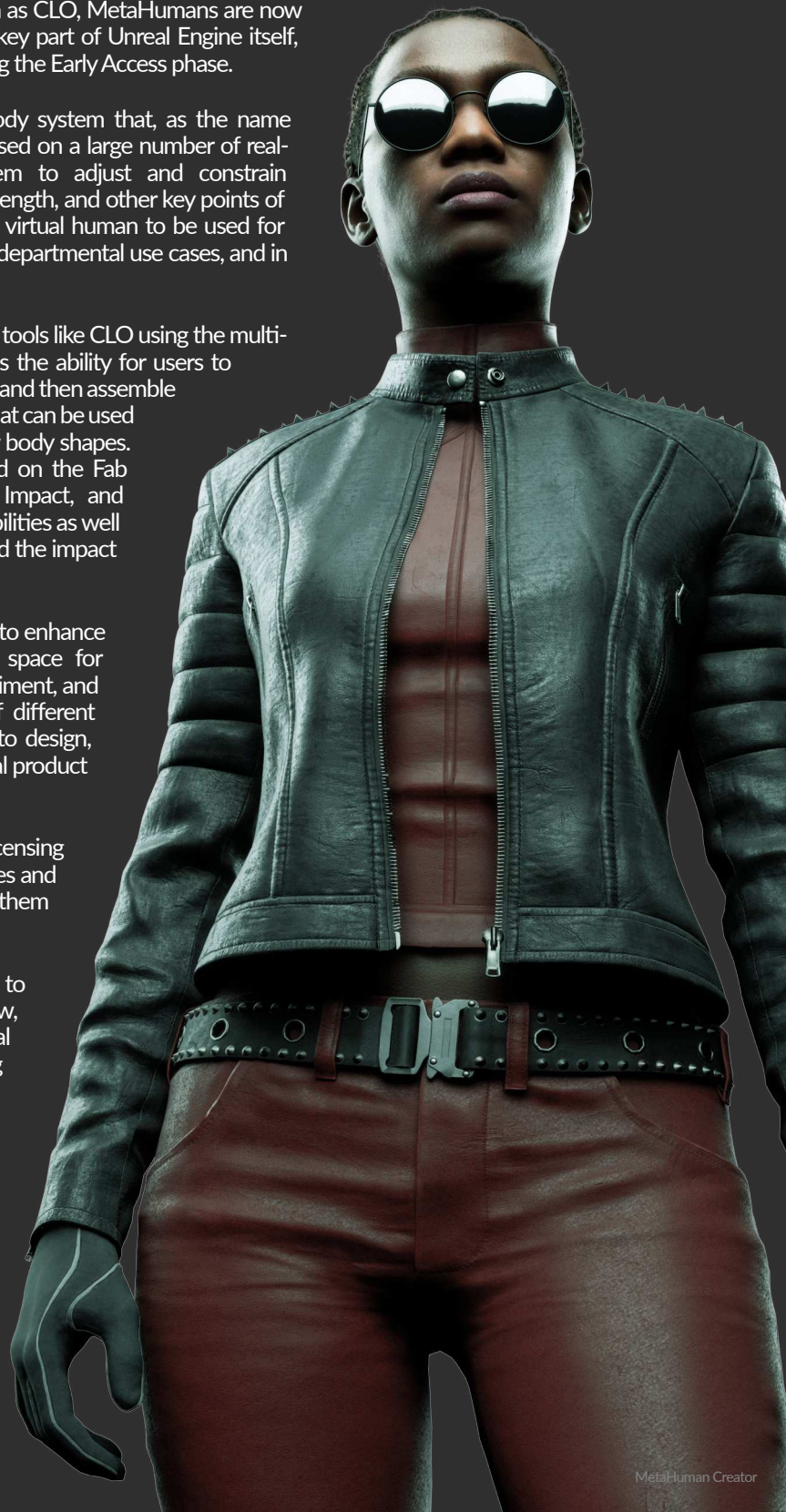
THE BUSINESS CASE FOR REAL-TIME

For an industry built on storytelling, it's only right that the business case for shifting to a real-time pipeline - and for adopting the toolkit that supports and extends it - be made on the same centuries-old criteria. For real-time fashion to take off, it must provide a direct uplift across almost every touchpoint where fashion conveys its narrative.

The business case for real-time, in other words, cannot simply be an extension of the arguments made for existing digital product creation toolkits. As well as enhancing the results that brands have already been able to obtain from those initiatives, real-time must also provide a reference frame for a new model of real-time decision-making.

"I believe the biggest difference between existing 3D strategies and the potential of real-time 3D is the potential to meaningfully transform decision-making for in-house teams and consumers," says retail and technology consultant Joshua Young. "With the right infrastructure and platforms in place to allow new and different audiences to interact directly with 3D, fashion has the potential to move beyond 3D as a static way to convey ideas, and to begin using it as a central pillar for getting closer to market by making creative and commercial choices in real time."

And this difference is more than just a matter of wording: it represents a fundamental rethink of how fashion has approached not just its prior 3D strategies, but its entire routes to market.

"The traditional go-to-market process is based on advance prediction and long lead-times for production," Young adds. "And while ultra-fast-fashion companies have been able to disrupt that model to some extent by doing it at historic scale, I think there's a much greater transformation that could be unlocked if fashion is able to switch to a new model based on not just 3D design, development, and sampling, but a more complete shift in how brands and their partners collaborate, make decisions, and engage the

Fornite X Balenciaga
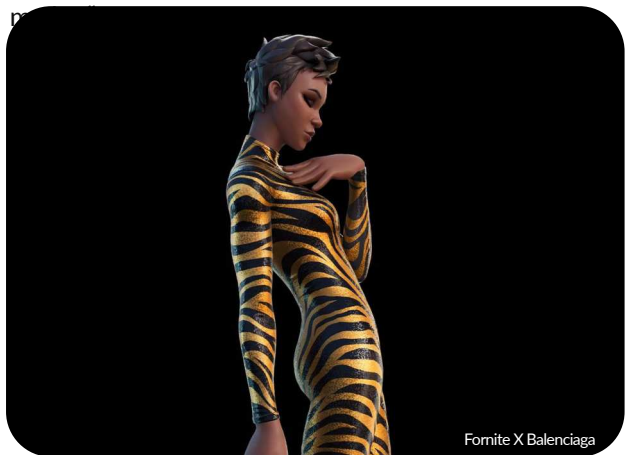
If the demands being placed on the promise of real-time are large, though, so too are the potential benefits, which, if this model of real-time decision-making takes root, will be measured far beyond the existing ROI metrics used to determine the viability of 3D pilots and projects.

"The same philosophy, and the same architectural shift, could underpin everything from domestic, just-in-time manufacturing to the unprecedented flexibility of virtual production as a way of augmenting product photography and videography," Young adds. "With real-time 3D, we're talking about a fundamentally different architecture – not just at the technology level, but in how apparel and footwear businesses structure their entire operations."

In practical terms, then, what does that architecture actually look like at the application level? Like the wider DPC ecosystem, the workflows and systems adopted by individual brands will be unique. But unlike the first wave of digital product creation, a real-time toolkit can already start to be built based on complete sets of capabilities, industry standards, and integration and interoperability

FOR AN INDUSTRY BUILT ON STORYTELLING, IT'S ONLY RIGHT THAT THE BUSINESS CASE FOR SHIFTING TO A REAL-TIME PIPELINE BE MADE ON THE SAME CENTURIES-OLD CRITERIA.

schemas that have been stress tested and proven by the biggest names in other industries.

And fashion also has the possibility of working with partners like Epic Games that have already spent decades supporting the creative and technical communities in those industries - and who have also been immersed for several years in building out the vision that the most forward-thinking fashion brands have for their own product creation, collaboration, and communication workflows.

Even just Epic's own umbrella, the tools that make up the ecosystem are already mature and connected. Brands like Sketchfab and MetaHuman have already become synonymous with particular use cases (universal 3D marketplaces and high-fidelity digital humans respectively) but the most relevant for fashion's immediate use cases are Twinmotion itself and, underneath it, the latest version of Unreal Engine, which was just announced at Epic's Unreal Fest 2025.

From a pure trust and reliability point of view, the business case for Unreal Engine is a straightforward one to make: it already powers the most critically-acclaimed video games, underpins cutting-edge filmmaking, and is used near-universally where a de facto standard for real-time visualisation, simulation, and interactivity is needed. From new innovations in scaling scene complexity without reducing performance (Nanite geometry) and real-time global illumination (Lumen), to the building blocks of interactivity that then stack up to create the best interactive entertainment, Unreal Engine is an ever-evolving powerhouse.

From an accessibility perspective, though, the onramp to working with Unreal Engine directly can be steep - something that fashion in particular has already found problematic from a supply perspective with existing DPC initiatives.

This is where Twinmotion comes in. Built on top of Unreal Engine ("UE"), Twinmotion is designed to be a user-friendly front end for experimentation, look development, and 3D storytelling. While it retains a lot of the power of UE, and is just as much a part of the extended ecosystem for computer graphics in general, Twinmotion is intended for non-technical teams to use, which, for fashion's purposes, opens it up to audiences that do not need to have either 3D modelling skills or detailed knowledge of garment construction or patternmaking.

For teams that understand the core principles of 3D objects in 3D space, Twinmotion provides an intuitive sandbox that needs relatively little in the way of onboarding. Several team members at The Interline are lapsed computer graphics hobbyists, and we were able to easily install Twinmotion, orient ourselves with the interface, and begin working to stage 3D objects in 3D scenes.

The key element, though, is that this sandbox does not have a high garden wall on the way in or the way out.

On a regular cadence, it implements the latest innovations from UE itself, including improvements to environment editing, shadow maps orthographic rendering, and camera animation in the latest release. And where fashion's strategies have, in the past, struck barriers created by proprietary file formats or idiosyncratic approaches to simulation, Twinmotion already accepts industry-standard assets, enabling users to quickly bring their products (prototypes or approved production samples) into new environments and instantly begin working
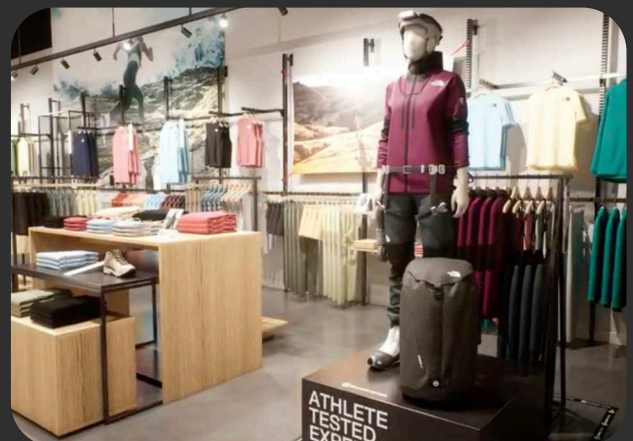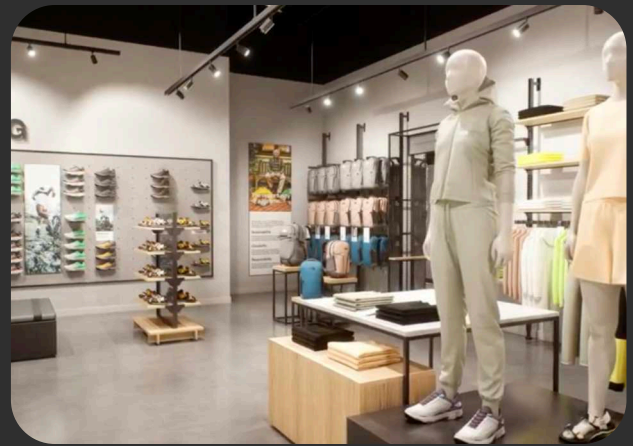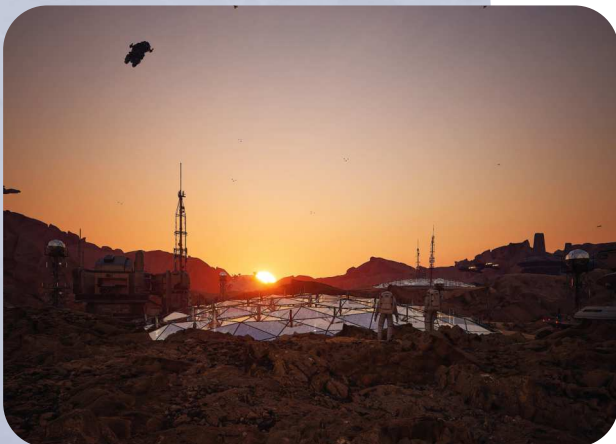
Images generated in Twinmotion

This interoperability, and the ability to keep a single asset 'alive' from design to digital endpoint, will be where the fashion-specific business case for real-time is rounded out even further, as Kiele Lowe from Browzwear explains.

"[From an interoperability point of view] fashion brings unique challenges - soft materials, diverse body types, and the need for true-to-life fit make the pipeline far more complex," she told us. "That's why Browzwear is built as an open platform, designed to integrate with the best technologies across the fashion ecosystem, from digital fabric scans to PLM and asset management. We treat file standardization and workflow continuity as core deliverables. We ensure consistent rendering and behavior across platforms through active contributions to glTF, USD, and ISO material specs and real-world validation. Our open APIs carry version control, metadata, and change history end-to-end, enabling a single source of truth. No more redundant exports. No more guessing the master file. For fashion, seamless integration isn't a bonus, it's a foundation."

And when it comes to delivering an output from those standard assets, Twinmotion's editor may require a powerful workstation, but the same storytelling sandbox that exists on a user's desktop environment can create a huge scope of different deliverables - from web-based product configurators to videos, panoramas, and presentations - that are consumable on any device.

So from a technical perspective, the case for adopting real-time tools is compelling. But what, exactly, does working in something like Twinmotion actually look like? And how does it differ from what teams have already been capable of doing in existing 3D tools and workflows?

Within a real-time pipeline, an end user in fashion would sit down in front of Twinmotion, import 3D assets that either they or their colleagues have created, and begin working with them the same way they would if they had a miniature world on the table in front of them, and an endless source of objects, materials, lights and other elements to decorate it with.

This means dragging and dropping physically-based materials, vegetation, props, and a huge range of other assets from the extensive built-in libraries to quickly develop and iterate on looks and create settings that convey the story of a product, and then adjusting the environment around that product by selecting the time of day, adding volumetric clouds or HDRI backdrops, turning on weather effects, and more. This might be a designer staging a virtual photoshoot in a sunlit forest clearing to communicate their design intent and secure adoption from their peers, or it could be a marketing professional working to captivate consumers by staging the same campaign on the surface of Mars.

Once the user is happy with how the product looks, and how the environment around it has been built, they might then switch from a drone camera to a first-person walkthrough to immerse themselves in the scene before deploying it to the cloud to share with teams, partners, or consumers.

These are a narrow slice of the wide spectrum of opportunities that Twinmotion alone opens up. And to demonstrate just how much additional possibility creatives are already extracting from real-time tools even in this narrow space, the Fashion Innovation Agency recently partnered with Epic Games to make use of Twinmotion to showcase the work of fashion designer Taskin Goec.

After scanning Goec's garments using photogrammetry, the combined team built two distinct environments to tell the stories of those garments in a way that was both turnkey and accessible, and that delivered a high-fidelity end result in the form of an editorial campaign.

A video documenting the production process - emphasising just how much creative power was placed in the hands of a designer who did not need to adjust to learning a new software pipeline - is now available to watch.

THE SCOPE OPENS UP THE INTERROGATION OF BUSINESS USE CASES THAT DO NOT JUST FALL OUTSIDE THE SCOPE OF TRADITIONAL DPC, BUT THAT HAVE SO FAR BEEN COMPLETELY UNEXPLORED

What this project — and the body of fashion, footwear, and accessories-focused work that is now being created in Twinmotion — demonstrates is that the same single shift from traditional 3D workflows to real-time 3D has the potential to not just instantly elevate the work of creatives, but also to become a fundamental piece of the puzzle for executive decision-making, content creation, production, and much more.

While Twinmotion represents the accessible, intuitive front-end, the ocean of possibility opens up when we consider that Epic's Datasmith (a bridge between both third-party and first-party solutions) guarantees that work done in Twinmotion can migrate to the fully–fledged Unreal Engine, or to the brand-storyteller focused Unreal Editor for Fortnite (UEFN), all while make sure that data hierarchies, structures, and the links between components and materials are maintained.

But possibilities on that scale will, by definition, require more than just the adoption of new solutions, however well-integrated they are.

"Moving from static 3D workflows to real-time 3D environments will require a fundamental shift in mindset and process," says Matthew Drinkwater of the Fashion Innovation Agency. "Ideally, this transition would unify traditionally siloed departments—allowing design, development, and marketing teams to collaborate seamlessly on digital assets that are not only used for prototyping but also drive immersive retail, digital storytelling, and personalised consumer experiences. The step change lies in breaking down these barriers to create a fully integrated, agile, and future-proofed workflow."

And that sheer functional scope also opens up the interrogation of business use cases that do not just fall outside the scope of traditional DPC, but that have so far been completely unexplored.

"I think the main question everyone will think and ask when looking at any real-time 3D solution is 'What do I use it for?'," says Dominic Sluiter. "In many cases we answer that question by mostly looking at what real-time 3D can do as a technology. But the important step for us should be now to think 'who / when / how' will use it. Identifying more precise use-cases that improve the process of the product development will guide us to the most efficient use of real-time 3D."

This expanded definition is also what, for executives who have been immersed in digital product creation from the very beginning, constitutes a fundamental shift in how the industry operates.

"Real-time 3D is not just a technological improvement—it is a fundamental platform shift that will redefine how digital content is created, experienced, and interacted with," says Jaden Oh of CLO. "Traditionally, 3D graphics were confined to specific industries, but today, real-time 3D is expanding into e-commerce, fashion, manufacturing, and supply chain management, signaling a much broader transformation."

Oh continues: "In the fashion industry, this shift goes beyond just digital applications like virtual try-ons or marketing visuals. What makes real-time 3D particularly impactful in fashion is its ability to handle real-world production data in real time. Unlike industries like gaming or film, where 3D models are used solely for visual representation, fashion requires a direct link between 3D assets and the actual manufacturing process. Every detail—fabric properties, trims, stitching, pricing, and supplier information—must be accurately represented and continuously updated."

"This need for real-time production data is driving the rise of 3D-integrated communication platforms like CLO-SET, which connect designers, developers, and manufacturers in a seamless workflow. Instead of relying on static files and manual approvals, companies can now collaborate in real time, adjusting designs, costs, and materials on a centralized platform. This reduces production lead times and improves efficiency and decision-making across the entire supply chain."

Designed by Canberk Karakas for The Interline.
Staged and rendered in Twinmotion by Martin Krasemann.

"At the same time, Unreal Engine is playing a key role in bridging digital and physical production workflows. With advancements in real-time rendering, physics-based fabric simulation, and immersive visualization, Unreal is becoming an essential tool for virtual showrooms, digital prototyping, and interactive retail experiences. As more brands integrate Unreal Engine with fashion-specific tools like CLO, we will see a more seamless connection between design, real-time visualization, and production planning."

"As real-time 3D technology continues to evolve, we can expect to see a fundamental shift in how fashion companies operate. Within the next 3–5 years, these platforms will become essential for streamlining workflows, minimizing waste, and improving agility in responding to market demands. Over the next decade, real-time 3D will be deeply integrated into fashion's core operations, making it a standard for design, production, and retail."

This perspective is also mirrored by industry insiders who work with, rather than create, the toolkits and workflows that fashion brands are using to fuel their digital transformations, and who deeply value the potential for the next generation of 3D to extract multi-part value from the same assets and the same pipelines.

"Real-time has the potential to meaningfully evolve current 3D workflows through an experience that closely matches the real-world, streamlining DPC workflows by allowing them to operate entirely within a 3D environment and removing the limitations of static visualisation," says experienced DPC insider Beth Jackson.

And this same simultaneous extension of value and streamlining of workflows is something other seasoned DPC leaders see as the key to further reducing lead times, unifying systems, processes, and people - and building greater trust by increasing the number of touchpoints that professionals across the extended product lifecycle have with 3D assets and objects.

"Until recently, renders of 3D assets have been widely accepted by our organisation and the industry in general as the primary asset request type and 'better than it used to be' when styles were represented as a 2D sketch," explains Kayla Woehr of New Balance. "But, the reality is that a render of a 3D is still two dimensional. As our teams and the industry become more accustomed to seeing 3D, and as our tools (such as PLMs and DAMs) advance and become capable of housing these assets, the desire for real-time 3D assets to interact with will increase, and [this becomes] the next logical step in the evolution of 3D assets."

At New Balance, the trajectory of this progress is already starting to take shape. And as part of the cultural shift Kayla identifies, a process and pipeline evolution has seen the brand's apparel team shifting its emphasis from creating for real-time use cases as an ancillary benefit of DPC, to indexing for those use cases from the outset.

"Currently in our workflow, real-time 3D assets are a byproduct created after the fact and on an 'as-needed' basis," Kayla adds, "but we have already been preparing for this by testing new workflows that enable us to create real-time 3D assets at scale from the start."

This strategy - building out the foundations required to give a real-time pipeline the best chances of success - is also one that industry analysts and advisors see as being a smart near-term bet, since it could allow the brands adopting it to fast-track, participate in, and influence the development of the extended ecosystem that will be needed to support larger ambitions for 3D.

"Real-time 3D will require a firm foundation if it is to be used reliably and continuously," says Dominic Sluiter of EnhanceThat. "[This] doesn't mean that real-time solutions have to be "postponed" until the foundation is ready. Absolutely not! It just means that strategising for real-time 3D use cases early will be key to then tracing them back through all the steps that will be needed to build them."

This may sound like a tall order for an industry that has, by and large, compartmentalised its 3D and DPC efforts, since the distance between those current applications and the promise of a full-scale, end-to-end enterprise transformation can seem vast. But the key to attaining those eventual goals, according to Sluiter, will be to break them down into areas where a switch to real-time working will deliver tangible value in the interim.

"Brands can start with simple products, smaller scale processes, and build up the full end to end chain with real-time 3D," Sluiter says. "And from that point on, [the plan becomes to] gradually scale it, improve it, widen the adoption through other product groups and user groups. But always keep an eye on every step of the chain. Don't focus only on one!"

As compelling as this idea of segmenting the move from traditional 3D to real-time is, though, professionals like Beth Jackon recognise that individual projects, pilots, and ideas must still be unified under a common umbrella - one that serves to provide ongoing alignment to a cohesive vision for real-time working, and a business case that takes account of existing DPC maturity.

"The ability to successfully integrate real-time within DPC processes is reliant on buy-in and investment, and it needs to be championed by a long-term vision that supports brand success," Beth explains. "To better serve the end-to-end product journey, real-time capabilities need to be tailored for DPC requirements and experiences."

And this recognition of where 3D centres of excellence sit within brands, as well as where DPC strategies have encountered resistance, will also be critical to encouraging audiences who perhaps share the vision for digital transformation, but who have struggled to buy into the results of traditional 3D.

THE RECOGNITION OF WHERE 3D CENTRES OF EXCELLENCE SIT WITHIN BRANDS, AS WELL AS WHERE DPC STRATEGIES HAVE ENCOUNTERED RESISTANCE, WILL BE CRITICAL TO ENCOURAGING AUDIENCES WHO HAVE STRUGGLED TO BUY INTO THE RESULTS OF TRADITIONAL 3D

Image generated in Twinmotion
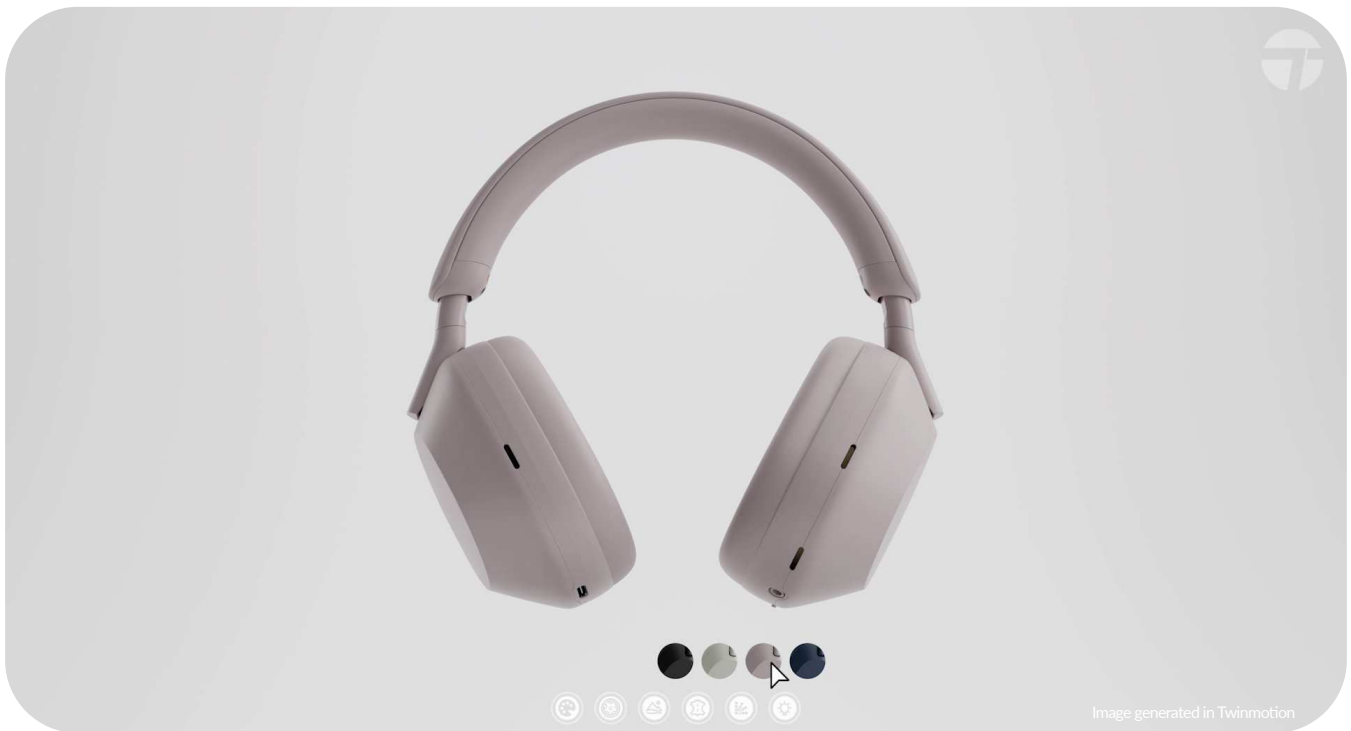
"I believe it's a matter of trust for everyone," says Cyrille Ancely of Decathlon. "Each company is different, but the common factor will be that some part of the product journey does not believe that 3D can capture the essence of their role, or that they can't yet make the right decisions based on a 3D asset."

"Against that backdrop, it can be hard for the entire value chain to move forward and become fully 3D-native - because at the moment the two extreme ends of the chain, design and communication, are well-served by 3D and are becoming more experienced with 3D tools, but there is a community of professionals in the middle who have specific demands and expectations that it will take time to cater for," Cyril adds. "I think the use of real-time 3D has the potential to bring this community on board, but it will not happen overnight."

This, above all else, is the most critical takeaway for readers of this report - whether you find yourself working with 3D assets at a distance, in the abstract, or in a direct, hands-on way, a real-time revolution will thrive on taking input from everyone. Whether the applications you can envision, after reading this, tap into and extend the existing digital product creation ecosystem, or whether they look like something entirely new and experimental, they will benefit from everyone who touches the product journey going hands-on.

"Trust in 3D samples comes from consistency, speed, the right quality assets and ease of use - all of which are equally important - but trust is also earned through experience," adds Dominic Sluiter. "By spending time directly engaging with the tools that represent the future of 3D, and using that experience to refine consistency, standardisation, interoperability, and reliability, the fashion industry will be helping to build 'trustworthy' technology, and then trust in the power of real-time 3D will come."

And from this perspective, there really is no substitute for seeing new software firsthand, and (either directly or as a team) working with the tools, environments, and workflows.

The right story in fashion, whatever narrative it contains, is the one that brands, retailers, and their partners tell themselves - confident in the knowledge that they will then be supported by the right content and technical ecosystem to then communicate that story to the people who matter, both before and after them in the product journey.

Critically, nothing we have described in this paper is theoretical. While not every point of integration between the existing frameworks of digital product creation in fashion and the real-time toolkit is complete, and not every workflow is fully built-out, the roadmap to real-time is firmly ahead of us. And it doesn't just live in reports like this one; it can reside on your desktop today.

If you have a capable local CPU and GPU to experience it, The Interline's recommendation is that everyone in fashion spends a bit of time experimenting and getting to grips with Twinmotion. As well as providing an easy usability onramp and the clearest view of the flexibility and accessibility of real-time rendering, Twinmotion also benefits from being the starting point for professionals in a range of other industries - meaning that self-paced education and professional training are both readily available, and both approaches to learning also, like the tool itself, feed into the wider ecosystem that has grown up around Unreal Engine.

For a more tailored perspective on how to get started on understanding and influencing the building blocks of real-time in fashion, The Interline and Epic Games will be running a live online event in the summer of 2025.

And finally, as the next logical step in fashion's digital transformation, real-time 3D will have a larger presence in the 2025 edition of The Interline's DPC Report - one befitting the vital role it could be about to play in telling the next chapter of the continuing 3D story for apparel, footwear, and accessories.

EPIC GAMES

This Handbook is supported by Epic Games, the company behind culture-defining properties like Fortnite and stress-tested, turnkey tools like Twinmotion. To find out more about their suite of available tools, click on the relevant logos below.

TWINMOTION

METAHUMAN

UNREAL ENGINE

UNREAL EDITOR FOR FORTNITE

FAB

Further Reading

Consider downloading The Interline's latest DPC Report - a 160-page deep-dive report on the progress, the philosophy, the community, and the outlook for 3D and digital product creation in fashion.

The INTERLINE