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THE DPC REPORT



The INTERLINE

SOURCING at MAGIC



INTRODUCTION

BY BEN HANSON.
EDITOR-IN-CHIEF. THE INTERLINE

DOCUMENTING THE NEXT CHAPTER IN ONE OF FASHION'S BIGGEST, AND FASTEST-DEVELOPING, STORIES.

If you work in a 3D or digital product creation (DPC) role, whether you realise it or not, you're part of a community that's fundamentally reshaping the whole of fashion. And the output you and your peers create - digital representations of physical products - is one of the industry's hottest commodities, in huge demand all the way downstream and all the way up.

But it wasn't always this way. For a long time (decades, in fact) 3D existed on the periphery of fashion, being pushed forward by pioneering tech companies and passionate design and development professionals who laid the foundations for the whole-enterprise possibilities that the industry at large only woke up to later.

As belated as that awakening perhaps was, though, the wider industry did recognise the potential of digital product creation in a major way. Our first DPC Report, which launched at the end of 2022, unpacked the two key reasons that 3D and DPC strategies rocketed up the maturity curve but it's worth quickly rehearsing them here.

The pandemic was obviously a prime contributor. It simultaneously halted physical prototyping, shifted shopping towards digital channels where virtual photography could keep product in front of consumers, and separated creative and commercial teams who needed to suddenly adapt to remote working.

Behind the smokescreen of COVID, though, the rapid uptake of 3D design and DPC-ecosystem tools also succeeded because it had decades' worth of technology maturity, process innovation, and tireless championing from enthusiastic software teams, technical designers, creators and other industry professionals behind it.

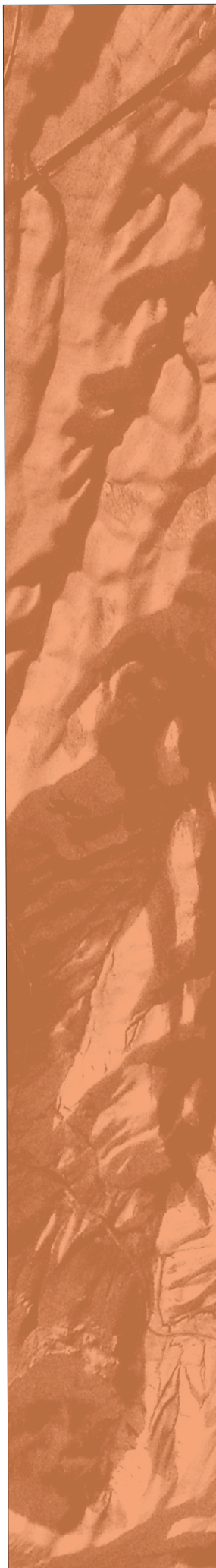
We could debate the lasting impacts of the pandemic at length, but really the story of digital product creation is a story of communal vision and perseverance. And this year's DPC Report is, in part, a love letter to the community that turned an offshoot of fashion technology into one of its major enterprise segments.

But this is The Interline, after all, and we're nothing if not insistent about looking behind the curtain. So this report is also a dissection of not just how DPC reached the tipping point we documented last year, but what happens now. Over the next hundred-plus pages, our team and our supporters set out to dissect the tension between the potential of digital assets (which is driving historic demand for them) and just how much work needs to go into creating digital assets that serve the needs of a massive range of different stakeholders.

We also wanted to look at how fashion - across apparel, footwear, and accessories - is progressing towards the goal of building out the processes and cultures that will be required to make DPC the foundation of an entirely new way of working. What still needs to be done to build the scaffolding that's going to support the elevation of digital representations of products into true digital twins?

And this report is, of course, another examination of the DPC technology and advisory landscape: the pipelines, the systems, the strategy, the frontends and backends, and the tools and integrations that bring ideas to life in every meaning of the word: aesthetically, functionally, commercially.

Because the next chapter in fashion's headline story is still very much being written, and like all stories there's still the possibility that it might veer off track. I might have been doing this long enough to be able to look back over more than a decade and see steady progress



that began to really ramp up recently, but I can also potentially envision that adoption curve dipping back down if the current economic environment slams on the brakes without DPC strategies being allowed to truly demonstrate their potential.

So a big part of this report - and the first part you'll see after these introductions - is taken up with first-hand stories from people who've been instrumental in steering DPC strategies and spearheading adoption for some of the world's most recognisable brands. And you'll also hear stories from a new generation of talent, who have only known a world of 3D design, and who represent just how vital it has become.

After that, you'll find profiles of some technology companies who are positioning themselves as key partners for the different stages of the DPC journey. And finally you'll find the next stage in our market analysis, which looks at what happens next, once a previously-fringe technology segment becomes one of the driving forces for an entire industry's digital transformation.

Like everything from The Interline, you'll have either downloaded this report directly from us, without having to part with any personal details, or it will have been shared with you by a friend, a colleague, or a prospective partner. It won't have sat behind any sort of content gate or paywall.

That's our preferred distribution strategy for all our content, but it's especially important that this report is free to reach the widest possible audience. Because digital product creation is going to be so indispensable to everything fashion wants to do - from sustainability to real-time experiences - that everyone deserves to be informed about not just the potential but the practical reality, without any barriers in their way.

By reading this report, and sharing it, you're helping to support The Interline and keep all our future content free and open. We're also glad to have the continued support of the DPC technology vendors who appear in the technology section of this report, and of our partners at SOURCING at MAGIC, who are committed to making 3D and DPC part of the much broader fashion technology conversation that's happening at their headline events. You'll hear from Kelly Helfman, President of Informa Markets Fashion, about the expanding technology footprint of those shows on the next page.

Selfishly, I'm glad I had the opportunity to sit down and write one of these introductions again. Sometimes, in a role like mine, you spend a lot of time focusing on technologies that exist in narrow lanes: they might be all about cost, all about efficiency, or all about environmental impact. The DPC technology ecosystem, though, is the rare example that touches everything, and I know I'm not alone in finding it to be one of the most exciting areas of fashion today.

The DPC community might have started with 3D designers, tech entrepreneurs, and people who cared enough to manually scan in small material swatches to help visualise their ideas. But that community now extends to almost everyone in fashion, upstream and down. And there's never been a better time to join in.



Outfit designed by Harry Tribe, rendered in DMIx, using virtual models by DMIx / Verce. To find out more about Harry's process, turn to the editorial section of this report.

DMIx



THE OPEN OPPORTUNITIES OF DIGITAL TRANSFORMATION

BY KELLY HELFMAN,
PRESIDENT,
INFORMA MARKETS FASHION

It's rare to have a conversation in fashion today that doesn't involve the word "digital" in some way. Whether people work in design, buying, merchandising, sourcing, marketing, or any number of other job roles - their daily lives are constantly touched by technology.

In many cases, that means productivity platforms, spreadsheets, team chat, and databases - big enterprise solutions for large brands, and nimble, cloud-native software for small enterprises and emerging entrepreneurs. In a growing number of situations this also means looking at, interacting with, and making important creative and commercial choices based on digital assets which increasingly feature complete virtual representations of physical products, designed to streamline the process of making the real thing.

In my introduction to last year's DPC Report, I wrote about the significant opportunity that this all presents: a chance to change the way fashion operates to become more digital-native, more driven by data, and, in the process, more creative, more efficient, more sustainable, and better equipped to manage a fast-changing consumer market.

In the year since, we've worked hard to advance at Informa Markets Fashion, at our in-person events, across our educational content, and through partnerships like the one we've built with The Interline.

The vital conversations the industry needs to have to continue moving forward and to tackle its biggest challenges are truly happening, and we are committed to bringing together each of the different stakeholders whose roles are being influenced by technology, and especially by digital product creation, to make sure that every voice is heard, and that the opportunities for change are open to all.

With everyone on board, there is so much more benefit to digital transformation still to come.

Informa Markets Fashion and The Interline will continue to work together in 2024, starting with The Interline helping to curate and host the technology content programme at SOURCING at MAGIC in Las Vegas, from 13th to 15th February 2024.

SOURCING at MAGIC The INTERLINE

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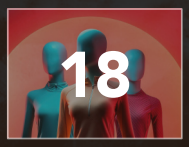

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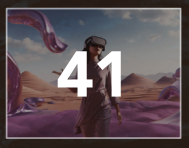

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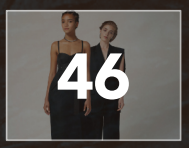

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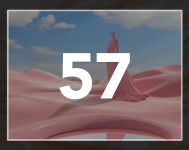
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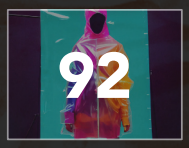
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THE 3D REVOLUTION WON'T WAIT

DESPITE RAPID UPTAKE OF DPC-ECOSYSTEM TOOLS, FASHION IS STILL LAGGING BEHIND OTHER INDUSTRIES IN ALL-ROUND DIGITAL TRANSFORMATION. HOW CAN YOU, AS A BRAND, MAKE SURE YOU REMAIN AT THE FOREFRONT OF CHANGE AND THAT YOU MAXIMISE THE VALUE OF YOUR DIGITAL TALENT, TOOLS, AND ASSETS?

IMAGE PROVIDED BY CREATION FIELDS.



BY EVA MATTSSON CULAFIC,
FOUNDER, CREATION FIELDS

Creation Fields is an agency working with brands to support digital transformation. The founder, Eva has, with an entrepreneurial mindset, always been eager to explore and develop business strategies following the needs of the market. Eva has extensive experiences from being a buyer, product developer, sourcing manager, and production manager closely connected to the product. For the past decade she has also been running a consultancy firm specialising in product development.

I love fabrics. I love digging into details. I love seeing how something drapes or flows, and agonising over the buttons, the zippers, or the choice of a wrapped seam. In short: I love production, and it has been my profession for almost 20 years. I think most of us who work with fashion love the touch and feel of the fabrics, and the intricate details of the garments and products. But that passion comes with a cost; It is not sustainable to experiment endlessly using finite resources. And it is certainly not efficient.

Recent reports show that the gap between the industry's sustainability goals and what we do in our daily operations, and in sourcing and production, is widening. Fashion may be moving closer to some of its environmental goals in other areas, but in the core business of creating, iterating, and conducting technical development, most of us are still heavily reliant on physical prototypes and samples.

It is encouraging to see that the ambition among creative and technical designers for sustainability is high, and I know from experience that we all want to improve and work in a better way for the future, but setting goals is one thing - to live up to them and act for change is another.

Why 3D?

I have dedicated the last three years to digitisation in general and Digital Product Creation in particular. That might seem strange given my self-proclaimed love for the physical product, but nothing could be further from the truth. I'm a firm believer in the idea that the digitalisation of our industry will not reduce creativity or limit the passion for fashion and product - if anything it will enhance it.



IMAGES PROVIDED BY CREATION FIELDS.

Enabling smart processes and supporting early decisions using digital assets, for instance, does not mean that the quality of the end product will be jeopardised. Instead, these new processes free up time, since we can make product decisions earlier and with greater confidence - which gives the approved styles that will reach the end consumer more time and focus in technical development, engineering, fit, and other critical lifecycle stages. The goal is the same as with conventional product development - to put products on the market that we are proud of and the customers will wear and love for a long time.

And to be completely frank, we in the fashion industry are quite off-trend when it comes to taking advantage of technology in service of that goal. Looking at other industries, 3D design and simulation have been used as a creative, collaborative and supporting tool for decades. The car industry started with digital CAD and 3D designs in the 80's. Shortly after architecture and construction followed, as well as industrial and product design in virtually every field. Essentially all the other creative and design-driven fields are now digitised, and their journeys (and even some of the industry-agnostic tools and best practices they use) exist as templates and inspiration for fashion to follow.

When I founded Creation Fields, it was to help companies find the right path in the jungle of digitalisation and digital product creation, because while those templates are out there, actually adapting them to fit fashion's unique challenges and particular ways of working is not as straightforward as it might sound.

Like the team at The Interline remarked in the first DPC Report in 2022, after the first years of the pandemic, the interest in 3D visualisation exploded and many, myself included, saw its advantages in a clearer light than ever before. With physical prototyping and sampling taken off the table, it became more obvious that 3D could be seen as more than just another tool in the design and



development toolbox - it had the potential to be a disruption in the industry's entrenched ways of working, a change that could forever transform the fashion industry as we see it today. The journey to 3D in fashion had been underway for a long time prior, but thanks to a combination of technological maturity and external drive, we were now talking in terms like "photorealistic garments" and "products that come to life" in the digital world - a sudden and significant step in the right direction.



IMAGE PROVIDED BY CREATION FIELDS.

In addition to these new technologies, an unforeseen positive consequence of the pandemic was that old obstacles and barriers were removed. The infrastructure of digital meetings and presentations became standard practice. The switch towards the digital way of working was off to a flying start, and for a lot of organisations that progress has not been walked back even with a return to hybrid or in-person working. For many of the world's major brands, digital assets are now driving creative and commercial decision-making to an extent it would have been difficult to predict just a few years ago.

So Why Doesn't It Feel Like A Revolution Yet?

Based on the catalysing effect that COVID had on 3D and DPC adoption, the recent slowdown of the global economy should have been a cue for even deeper deployment. The conditions were right for another explosion of interest in more cost-effective, agile, collaborative methods that free brands from the need to bind up capital in physical design, development, and production of products that then sit in market channels, unsold. But instead, I see companies getting lost in what from the start seemed to be a well-mapped 3D journey - either pulling back from initial investments, or putting the brakes on extending the value of digital product creation outside of pilot programmes and isolated deployments that were confined to design and development departments.

I have seen companies invest significant time and resources in digital transformation - striving to become leaders in the field - getting lost due to minor issues on the way. Or struggling to build trust or secure wider enterprise buy-in into what should be a clear-cut upgrade to processes that are driving out of lockstep with a fast-changing market. And the volatile global economy has also made many companies hesitant or even afraid to continue spending on innovation, resulting in cutting Research and Development budgets, when they should remain the same, or just be used in smarter ways.

Pattern makers and designers are commonly the first ones to board the digital train, creating visualisations of products in 3D. Design and Pattern schools and education now have 3D on their curriculums, and we tend to expect that new employees will manage the 3D tools. However, what many companies do is add 3D to traditional workflows. Yet, this is the first mistake. We should not ADD work to get 3D in the process; digital product creation is not an additive burden, but instead a way to sidestep so much of the inefficiency that characterises the way design teams currently work. But if those possibilities are positioned as extra work, or a new toolkit to learn, then adoption is not destined to follow.

When implementing 3D, brands, retailers, and their partners instead need to think and work cross-functionally throughout the organisation, and to use digitalisation in a smart way. For example, in Creation Fields, we often start by working with carry-over products, where an existing style is just being updated in new colours. The styles are true and tested at the pattern and material level, and by visualising these in high-grade digital renders of the new colours - instead of creating entirely new samples - production costs and environmental impact are reduced. Switching physical sale samples for digital renders in this

relatively easy way has helped some of our clients cut their sample cost by 80%, and the reduction in terms of carbon emission has been calculated to be over 90%. These are hard positive numbers at a time when fashion is in desperate need of them.

And besides being more sustainable and more cost-efficient, 3D is also faster. We routinely work with product teams to identify the decisions that can be taken based on 3D, and we see that such decisions lead to cutting time to market by up to 50%. What's more: as the quality and accuracy of digital assets improves, there are more of those decisions that can be taken without a physical sample than ever before!

Another area where 3D can be used easily and with great success is in e-Commerce. Creation Fields have supported several consumer-facing A/B tests together with clients, where 3D images have been used in online sales with conversion rates as high - and sometimes even higher than - conventional photos. This drastically reduces the step from production to sales and marketing, while cutting costs for photoshoots and making styles available to market (across both B2C and B2b wholesale channels) much quicker.

To me, this is how digital transformation should work. And the arguments for deploying it in these kinds of use cases are extremely strong - certainly strong enough to overcome any hesitance or inertia that comes from brands having long-established ways of working that they don't want to disrupt, or from cold feet relayed to the current economic climate.

If you, as a brand, need a better, faster, more cost-effective way to work: digital product creation is it. And it can be implemented wherever there is the best use case for it, depending on your specific strategic objectives.





IMAGES PROVIDED BY CREATION FIELDS.

If you start with the lowest-hanging fruit in your organisation, the transition will be easier and the next steps will appear naturally. Whether it's design decisions, digital fittings, marketing, or sales. Physical samples will not disappear completely, but we as an industry need to substantially reduce this unsustainable, expensive, wasteful way of working now that we have ready access to the tools we need to do so.

So I want to use this article - and everything else contained in this report - to encourage the digital teams, the people pioneering the process, and the executives and department heads spearheading and sponsoring it, to keep going despite the current challenges. When the market changes, or the wider financial situation is applying restrictions: revisit the goals, rework the strategies, be agile, and adapt to the new tools and conditions. Just remember to keep working on it, because the business case for digital product creation is stronger today than it's ever been.

To business leaders looking for ROI on joining the next steps in the digital revolution, my message is simple: when you switch part of your process to use 3D representations of your designs, you reduce the number of physical samples, which will save you time and money. At Creation Fields, we have seen multiple companies saving sample costs by switching part of their sample collections to 3D, first season. And all this with the benefit of lowering the company's and industry's carbon emissions.

What you choose to do with those digital assets afterwards - and there is a huge possibility horizon out there - is up to you, but it's eminently possible today to start with an easy ROI, and then to build on top of that to deliver compounded benefits across the value chain - all from a single commitment to doing things digitally where it makes the most sense to do so.

The question should really be: what would be the return on NO investment?

The simple fact is that there are not enough resources to continue making as many samples as we do today. The current design and development process is depleting the planet, and placing a large burden on the people in the supply chain. Transporting all these samples further adds to CO2 emissions - all of which is largely unnecessary if we are able to put the confidence and trust into 3D assets that they deserve.

And as tempting as it can be to see this as a choice, there are more regulations and standards for sustainability being introduced or expanded all the time, and digitalisation will be one way to transform in the right direction.

Last but not least - attracting the best employees will be difficult for companies that are not joining the revolution. Talented, creative, and driven employees will be attracted to companies that evolve and invest in the future - from making the right values-driven choices, to equipping their creative and commercial teams with the best possible tools.

These changes will happen. This season or next. The choice you face is whether to be in the forefront or lag behind.

It might not feel like it today, but in ten years from now, I am confident that looking back at this time we will see that we were in fact, in the middle of a revolution - the same revolution that other industries have already paved a path towards. All fashion needs to do is have the confidence to follow it.



IMAGE PROVIDED BY CREATION FIELDS.



VILA EVOKED Shop Concept

THE STEADY MARCH TO SHOWCASE QUALITY DIGITAL ASSETS

WITH PHOTOREAL FINAL RENDERS SETTING AN EXTREMELY HIGH BAR FOR THE PRESENTATION OF DIGITAL PRODUCTS DOWNSTREAM, WHAT ARE THE MILESTONE STEPS FROM INITIAL EXPERIMENTATION TO A MATURE DPC PIPELINE? AND WHAT CAN FASHION LEARN FROM A BRAND THAT'S WELL INTO THE JOURNEY?



CHARLOTTE FABIENNE STOBRAWE, HEAD OF 3D AT VILA

Charlotte Stobrawe is a seasoned professional in the fashion industry, specialising in digital innovation. With a background in both traditional fashion design and 3D technology, she has led transformative initiatives, particularly at VILA, part of the global fashion group BESTSELLER. Charlotte's expertise lies in integrating 3D across departments, from design and development to marketing and sales, aiming for comprehensive digital product creation.

The Potential Of Digital Twins

The integration of digital twins in the fashion industry signifies a transformative shift with the potential to revolutionise various aspects of fashion, spanning from design to presentation. Beyond a mere technological addition, digital twins could present a groundbreaking opportunity for the fashion world to redefine the creation process and establish novel ways of engaging customers. However, it's important to note that seizing these opportunities requires collaborative efforts from brands, their teams, and technology partners.

"Fashion's digital transformation extends well beyond design and development"

Moving Beyond Proof Of Concept

Fashion's transition to making deep use of 3D technology has been a journey filled with both anticipation and challenges. Brands embarked on this path with the promise of enhancing efficiency, reducing costs, and minimising physical samples - and the longer-term goal of further extending the use of digital assets to a range of downstream use cases.

While 3D technology has been available for a while, its successful implementation has taken time. Most fashion brands initially embarked on digital twin exploration through narrow pilot schemes, often confined to a single product category. However, as they progress from this experimental phase to comprehensive integration, it's becoming increasingly evident that digital twins clearly confirm their value across multiple dimensions of the business. In other words, there has been validation for both the near and longer-term ambitions.

It's essential to highlight, though, that the true value (and the real return on investment) unfolds when fashion brands move beyond standalone 3D design and fully embrace the concept of a comprehensive digital twin: a digital asset that can act as a stand-in for the physical counterpart in a wide range of different scenarios. This transformative notion presents a unified solution built on a common foundation, with applications ranging from product design and development to sales and customer engagement, offering a new paradigm for the fashion industry.

Navigating High Expectations

The excitement surrounding 3D technology often leads to high expectations. Brands anticipate immediate efficiency, creativity, and sustainability gains, but the reality is that transitioning to digital twins is a gradual process. Every brand faces similar challenges, including the need to educate various teams, invest in suitable hardware and software, establish a well-coordinated 3D ecosystem, automate processes, and effectively manage change. Success lies in how these challenges are approached.



VILA: VFX image - 3D mesh top on real model

It's essential to remember that 3D impacts various aspects of the business, so taking a step-by-step approach to implementation is key to navigating this transformative journey effectively. But the results in focused areas can be profound, and there are brands that have, for example, pursued high-fidelity visualisation and virtual photography and achieved incredible results in a short timeframe. This is one area that we prioritised at VILA, and I know our entire team is proud of the results - some of which you can see on these pages.

But it's crucial to balance the appeal of 3D visuals with an understanding of the substantial effort and investment required behind the scenes. There's a notable difference between using 3D for branding and customer-facing applications, and truly integrating digital product creation into the core business. Unlocking 3D's complete potential requires dedication to both its ability to captivate people and the more practical, pragmatic aspects. It's not solely about creating visually striking initiatives; it's about achieving lasting value by embracing a comprehensive approach to the creation and use of digital assets at scale.



VILA: 3D pack picture

The genuine return on investment in digital product creation and digital twins often arises from enhancing processes, fostering collaboration, aligning departments, and focusing on the compounded benefits of this innovative technology.

Forging Your Own Pathway To DPC

Simultaneously, the path to successful digital twin implementation requires a deep understanding of practical implications, and it is essential to acknowledge that there is no one-size-fits-all solution. What works for one brand or department may differ from what suits another, highlighting the need for a customised approach tailored to the specific needs of each team. Discovering these tailored solutions underscores the

Importance of teamwork and fostering a culture of open communication and collaboration.

Encouraging cross-functional teams to share insights, learnings, and challenges ensures a collective understanding of the transformative journey, laying the groundwork for a successful integration of digital twins. And for each of those teams, having the ability to make decisions based on trust in digital tools and digital assets will not only change the way they work day-to-day but also enable the wider business to be as agile and innovative as it needs to be in order to keep pace with the speed at which fashion is changing.

No Shortcuts To Showcase Quality

While the visible benefits of digital twins may lead to a desire for rapid scaling, it's crucial to proceed with care to ensure that scaling is done without compromising the quality of digital twins or renderings. Starting with simpler product categories like woven and jersey products allows teams to gain valuable experience in 3D, building expertise in using digital twins effectively.



"The future is promising as technology evolves"



VILA Online Days 2023

To advance, it is crucial to establish strong foundations. This involves creating a robust pipeline, a well-structured 3D ecosystem, efficient workflows, comprehensive asset libraries, and clear quality guidelines - all of which are essential to support teams in their efforts to become more productive. Quality standards vary throughout the design and development process, but when digital twins are used for sales to replace photo samples, they must attain the highest quality level possible. Every aspect, inside and out, must be perfected to create a true digital twin.

Elevating Sales With 3D: VILA's Vision

Fashion's digital transformation extends well beyond design and development, and this is a vision we take to heart at VILA. Our primary goal is to fully integrate 3D throughout our entire business including marketing and sales, captivating customers, increasing engagement, and meeting performance goals. As a brand with a strong B2B focus, the current emphasis is on seamlessly incorporating 3D into the core of our Digital Sales Strategy. This initiative seeks to create an engaging and customer-tailored sales presentation while saving time and sales samples.

The strategy encompasses two pivotal elements: firstly, top-tier rendered images of digital twins that seamlessly blend with images of physical samples, fostering trust in purchases.This includes rendered packshots and VFX images, presenting 3D garments on real models. Secondly, 3D technology unlocks the potential for more engaging selling tools, such as 360-degree viewers and mix-and-match styling that traditional techniques couldn't deliver, thereby enriching the customer experience.

Build Trust In Digital Assets

As fashion shifts its focus towards digital sales, the production of high-quality renderings at scale becomes paramount in both consumer-facing and B2B scenarios. These renderings play a crucial role in assuring customers that the virtual representation accurately mirrors the physical product they will receive.

Achieving this level of fidelity requires several critical factors to align perfectly. It starts with a flawless digital twin asset. High-resolution texture scans and print files are essential to replicate the fabric's realistic appearance, while precise physical properties ensure an authentic drape. The devil lies in the details - trims and finishings must be faithfully reproduced.

The journey doesn't end here, as once the assets are of the highest quality, we venture into the realm of visualisation. Merging these renderings seamlessly with physical packshots necessitates replicating the photo studio environment in 3D including digital doubles of mannequins, lighting set-up, and camera settings. While it could appear relatively simple on the surface it is, in fact, a complex technical undertaking, and this is where a robust pipeline or 3D ecosystem plays a pivotal role in achieving the right levels of precision and quality.

The Importance Of A 3D Ecosystem

The selection of software, strategic hardware investments, and creative solutions, along with the seamless integration of software choices, serves as a cornerstone of the journey towards both high-fidelity visualisation and deeper use of digital twins. As some fashion companies initially use a single software package for 3D garment creation, transitioning to full-scale digital twin integration downstream quickly reveals the need for a more comprehensive approach. To unlock 3D's full potential, brands often turn to software solutions from film, VFX, and gaming.

Most of these solutions have built some fashion-specific features on top of best practices gleaned from other sectors, providing effective tools for photorealistic renderings and interactive content. Each software has its unique purpose, and the ultimate goal is to construct a 3D ecosystem that seamlessly supports efficiency and quality. This transition requires well-planned workflows that can accommodate multiple departments without compromising the quality of assets. To ensure efficient workflows, seamless collaboration is vital between 3D and non-3D users, requiring integration between 3D software solutions and existing non-3D software across the company.

Colour Spaces And Shaders

In the realm of 3D rendering, it's crucial to consider deeper technical aspects such as colour spaces and render engines. Colour spaces impact the way colours

are represented and manipulated. These spaces define the range and organisation of colours within digital content, such as RGB, CMYK, or LAB models. Various file formats may interpret and display colours differently, leading to discrepancies between the intended and actual appearances of digital images. This discrepancy can significantly affect the final output, making post-processing efforts ineffective. By establishing a unified colour space workflow, brands and departments ensure that digital images maintain their integrity and consistency throughout the entire process, from creation to the final presentation. This becomes especially crucial as brands utilise more exchange formats and digitalised garments, as it guarantees that the colour spectrum and truth of an image remain unaltered.

Furthermore, each 3D software relies on an integrated render engine, a specialised software that transforms 3D data into visually realistic or stylized images by simulating light interactions with objects and materials, calculating reflection, refraction, absorption, and scattering. These engines are vital for achieving lifelike lighting and shading effects. These render engines are complemented by shaders, low-level GPU programs that define lighting, shading, and other interactions between light and surfaces, determining how material properties are rendered as pixel colours.

The choice of render engine and shaders profoundly influences the visual quality and realism of 3D renderings, making them crucial in the pursuit of the perfect result. And some multi-category brands will even build different pipelines, made of different solutions, to achieve the optimum result for each product type.

Choosing The Right Software

Consideration must be given to each software package's role and purpose. This includes evaluating the learning curve for the team, the software's efficiency in daily operations, its ease of maintenance through tech teams, and the availability of extensions or plugins to enhance or streamline the workflow with minimal effort. Given the rapid pace of technological advancements and evolving requirements, it is crucial to implement new solutions non-destructively, ensuring that older workflows remain accessible if necessary. This approach provides a safety net, allowing the flexibility to revert to more stable, but older workflows should new systems face bottlenecks or unforeseen challenges.

Balancing In-House Expertise With External Collaboration

Whether choosing an in-house or outsourcing approach, the key is aligning the strategy with the project's goals and the desired outcome. For extensive, specialised projects that require rapid scaling, working with external vendors or service providers is often more efficient and cost-effective. These providers possess the specialised knowledge and resources necessary to support such large-scale projects.

While this approach offers growth opportunities, it also comes with certain risks and challenges that require careful navigation. It's crucial to manage the complexities of exchanging data between different software packages used by providers, highlighting the need for a well-integrated 3D ecosystem. For creative projects, collaborating with external talent can bring fresh perspectives and foster creativity. However, even when working with external teams, it's valuable to build in-house knowledge to provide creative direction and ensure the desired outcome, as well as laying the foundation for the right talent base in the future. The right mix of in-house expertise and externalcollaboration can unlock the full potential of 3D technology, supporting both creative storytelling and business growth.

Enhancing Brand Communication With 3D Visual Content

By harnessing the potential of Computer Graphics (CG) and Visual Effects (VFX), brands can create compelling stories, whether by digitally designing environments or enhancing real-life footage with 3D elements. 3D



VILA: Sunglasses #1 Effects 24



VILA: Earrings #1 Effects 24

storytelling empowers brands to forge profound connections with their audiences, fostering deeper emotional engagement and amplifying the effectiveness of their marketing and sales endeavours.

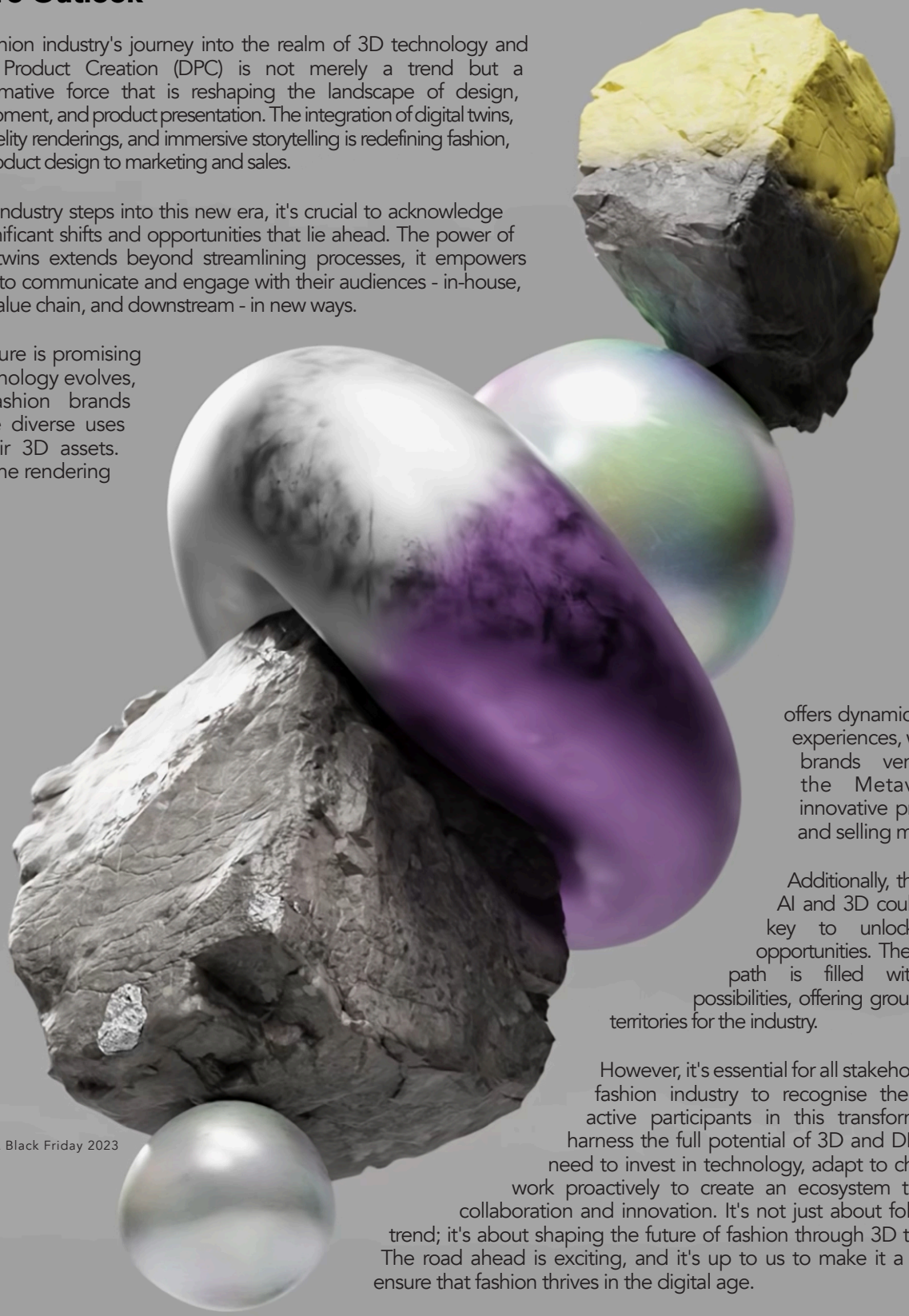
Furthermore, in synergy with emerging technologies like Augmented Reality (AR) and Virtual Reality (VR), 3D visual content opens up exciting new possibilities for immersive customer experiences and interactive brand narratives.

Future Outlook

The fashion industry's journey into the realm of 3D technology and Digital Product Creation (DPC) is not merely a trend but a transformative force that is reshaping the landscape of design, development, and product presentation. The integration of digital twins, high-fidelity renderings, and immersive storytelling is redefining fashion, from product design to marketing and sales.

As the industry steps into this new era, it's crucial to acknowledge the significant shifts and opportunities that lie ahead. The power of digital twins extends beyond streamlining processes, it empowers brands to communicate and engage with their audiences - in-house, in the value chain, and downstream - in new ways.

The future is promising as technology evolves, and fashion brands explore diverse uses for their 3D assets. Real-time rendering offers dynamic consumer experiences, while some brands venture into the Metaverse for innovative presentation and selling methods.



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Additionally, the fusion of AI and 3D could hold the key to unlocking fresh opportunities. The upcoming path is filled with thrilling possibilities, offering groundbreaking territories for the industry.

However, it's essential for all stakeholders in the fashion industry to recognise their roles as active participants in this transformation. To harness the full potential of 3D and DPC, brands need to invest in technology, adapt to change, and work proactively to create an ecosystem that fosters collaboration and innovation. It's not just about following the trend; it's about shaping the future of fashion through 3D technology. The road ahead is exciting, and it's up to us to make it a reality and ensure that fashion thrives in the digital age.



BUILDING A BLUEPRINT FOR DPC SUCCESS

FROM GROWING TALENT TO TAKING A PRAGMATIC APPROACH TO NEW TECHNOLOGY, THE PATHWAY TO SCALING THE VISION FOR DIGITAL PRODUCT CREATION WILL BE DIFFICULT TO NAVIGATE - BUT COLLABORATION, COMMUNITY, AND PERSEVERANCE WILL DELIVER RESULTS.

BY BRENDON RONON,
HEAD OF 3D / DIGITAL PRODUCT CREATION, GAP BRAND

Brendon is currently at Gap Brand where he is the Head of DPC on the Product Operations Team. Prior to Gap, he was at Tommy Hilfiger where he was a member of the Business Strategy and Operations team. Prior to Tommy Hilfiger, Brendon was at Global Brands Group supporting the implementation of PLM, 3D, and the creation of a new Design Operations team in Greensboro, NC. Brendon began his career in domestic production and product development, partnering closely with factories in NYC's garment district.

In the fast-paced world of apparel, staying ahead of the curve is imperative. After a long build-up, Digital Product Creation (DPC) has quickly become a transformative force in the industry, changing the way we design, create, make, and market our products. It has allowed us to ask ourselves critical questions about how we work today and what new possibilities may exist in the very near future.

Over nearly a decade working in DPC, I've focused on understanding what really matters most in the space, and I've found myself asking the same questions repeatedly. Should we prioritise introducing more tools and capabilities? Or work towards better integration of our existing tools? How much of our work can we truly automate? Is it necessary to build dedicated teams, structures, and specific skills to support this new way of working?

And finally, how do we navigate and leverage the interconnected ecosystem of relationships between brands, vendors, and consumers in the DPC era?

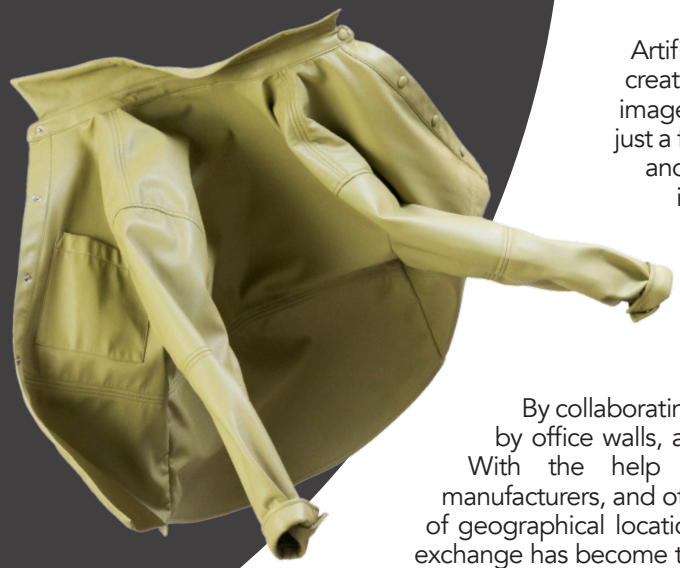


The Evolution of DPC

The apparel industry has come a long way since I first began my journey in the DPC space in 2016. From what started as explorative pilot programs testing 3D design tools, DPC has since evolved into a comprehensive, cohesive vision that extends across the entire product lifecycle. The transition has been marked by significant strides in digital innovation across almost every process, and it's recently coincided with the rise of Artificial Intelligence.

Today, we have the tools and technologies to not only create digital samples, but to change the way we interact with those samples, use them as a common language for global collaboration, and present them to our consumers.

The most obvious innovation has been the advancement of 3D modelling and simulation tools. Driven by the latest breakthroughs in computer graphics and computational power, 3D design tools allow teams to not only visualise but also interact with digital prototypes in an incredibly lifelike manner. This level of realism extends to the textures, drapes, and even the behaviour of fabrics, enabling designers to make better-informed decisions in a virtual space.



Artificial Intelligence (AI) can also now do things like quickly create AI-generated fit models and even generate inspiration images (or new designs) in the blink of an eye, with the input of just a few words. Pair that with what's been achieved in 3D / DPC, and the distance from idea to visualisation is now shorter than it's ever been.

Additionally, with the rise in crowdsource testing tools, teams can now be equipped with data-driven insights that inform their creative decisions, and lead to designs that resonate more closely with the consumer.

By collaborating in this new era of DPC, boundaries are no longer defined by office walls, and teams have become more agile and global in scope. With the help of cloud-based collaboration platforms, designers, manufacturers, and other stakeholders can work together seamlessly, regardless of geographical locations. Real-time sharing of 3D assets and instant feedback exchange has become the norm. This collaborative approach not only accelerates the product development process but also encourages diverse perspectives, resulting in more innovative and inclusive designs.

But it's essential to acknowledge that we still have a long way to go. While much has been achieved, several challenges remain on the road to achieving the full vision for digital product creation. In order to continue making DPC a widespread practice, brands need to address issues around standardisation, integration, change management, Subject Matter Experts (SMEs), and the scaling of digital processes with vendor partners.

New Technology Vs. Integrating Existing Capabilities; Finding A Balance

An important consideration in any company's DPC program rests on finding a balance between adopting the latest technology and achieving seamless integration with current tools and capabilities.

Should brands look to adopt the shiniest new technologies, or focus on maximising the potential of the tools that already exist and have achieved success and adoption? I'm a firm believer that it's not always about introducing new technology for the sake of novelty. Instead, it's about identifying the missing functionality of existing ecosystems, and assessing whether new tools can fill those gaps efficiently.



We must consider that any one new piece of technology is not a cure-all; it's the strategic integration and efficient utilisation of these tools that will drive real change. Finding uses for new tools, and reasons to quickly adopt innovation, is not the goal. We should be using new tools to solve existing problems and unlock previously inaccessible opportunities. But even though DPC unlocks new opportunities, no one technology solves all needs. DPC should enhance productivity and creativity, but also revolutionise the way brands develop product, which is a tall order for any single solution.

It's also not just about a shift to a new *technology*; it's about reimagining processes and workflows completely, from concept to consumer. It's easy to forget that the *true* main objective we have as business transformation leaders is to make work life *easier* and enable more creative time for those developing product. We have a hard time keeping that in focus because of the constant changes we experience in our own businesses, and in the industry at large, but digital product creation strategies should always serve the need to create great products.



Lastly, DPC solutions are evolving at a pace we've never seen before. Fear of missing out is a real feeling and we experience it daily, but that's OK. We should always be learning about these new tools and the value they could potentially provide. But overall, leaders must keep their eye on the end goal and stay nimble, embrace change, and encourage teams to maintain an agile continuous improvement mindset - but one that isn't fundamentally rooted in chasing newness..

Strengthening The Brand-Vendor Relationship

No DPC program will be successful without strong and close partnerships between brands and their vendors. Depending on their size, each brand could have dozens of vendors and upwards of 50-100 individual vendor employees with whom they partner on their DPC initiatives - all with varying levels of expertise, skills, technical knowledge, and technology capabilities. These stakeholders are just as important as the brands' internal teams.

The key to success lies in building bridges with these vendors, enabling seamless sharing of data, and creating a culture of collaboration. In my experience, it has been a common approach to leverage vendor partners to supply your digital assets, for which you will need to lay a collaborative foundation. Brands should first develop a playbook that educates vendors on how assets should be formatted, created, and delivered each time to unlock scale and standardisation. Vendors should also be encouraged to provide feedback on the playbook to ensure it works efficiently for them. Really skilled vendors may even incorporate best practices and learnings from other brands they work with into the playbook, to support the building of institutional knowledge.



This collaborative relationship is essential for success in the DPC era, and brands must recognise vendors as their closest strategic partners - especially where they are entrusting them with the creation of digital assets that then go on to have extended lifespans across the value chain..

Another key element of vendor collaboration in DPC is the use of a 3D collaboration tool. Collaborative platforms can bring teams together and foster real-time, cross-functional collaboration. With these tools, designers as well as technical designers can work with vendors directly, allowing for even greater creative collaboration that empowers them to feel as an extension of the brand design team. This way of working will also allow vendors to have a deeper understanding of the brand's vision, leading to better product outcomes with a "first time right" result and reducing misunderstandings and errors.

Strengthening the brand-vendor relationship in DPC not only offers efficiency gains but also brings more meaningful interactions, a shared sense of purpose, and a deeper connection between brands and their vendors. In this relationship dynamic, they are more than just service providers, but integral partners in shaping the brand's success and future, and no DPC strategy is likely to succeed long-term without their participation.

Upskilling And Developing Subject Matter Expertise

As the apparel industry has embraced DPC, demand has grown for the right talent, the right skill sets, and for ways to establish the necessary support structures for our teams to learn this new way of working.

To meet this demand, change management must be at the forefront of your strategy. It's extremely important to develop training and development programs, encourage a culture of continuous learning, and foster an environment that values creativity and innovation. While there might be more new 3D and DPC-native talent emerging from education today, it helps to first focus on upskilling your current team and ushering them into this new era of tools, technology, and process, since these will be the professionals who best understand your brand.

Those that are eager to learn, will naturally grow into subject matter experts (SMEs) and become the key people to help lead the charge towards DPC alongside you. There is also a very big opportunity to have SME's in the business help you demystify fear and tear down barriers to transformation. People fear the unknown, so the more you can over-communicate and educate, the better - something that process champions and people with first-hand design, development, and sourcing experience are in the best position to support.

Additionally, if you're a part of a larger organisation that includes multiple brands, a cross-brand DPC community and task force can be super helpful in sharing insights, best practices, and training resources between business units.

When it comes to upskilling your current team, consider the following:

1. Create a dedicated team of experts that focuses on systems training and change management that can facilitate training sessions and provide ongoing on-the-job support

2. Provide context and explain how the new tool or process fits into the bigger picture and supports company-wide goals

3. Acknowledge different learning styles by offering different modes of training including live training sessions, videos, resources, or peer-to-peer learning

4. Create an easily accessible training resource repository to store all resources and recordings

Conclusion

The future of Digital Product Creation is bright. There has been so much progress and innovation in recent years, but there is still much ground to cover. Looking ahead, as DPC leaders we must put in the time to evaluate the growing landscape of technology and understand how it could meld with our existing solutions and enable efficiencies.

Maximising the value of digital product creation and digital assets will be a matter of finding balance between adopting new, exciting technology and improving our current tools and workflows through integration. We must commit to building strong and fruitful relationships with our vendor partners and invest in upskilling our teams. The DPC era is forcing us to break down silos and improve collaboration on a global scale.

By working together, we can forge a path towards a more efficient, digitally innovative, and creative fashion industry - one that moves closer to realising the long-term vision for enterprise-wide digital product creation.



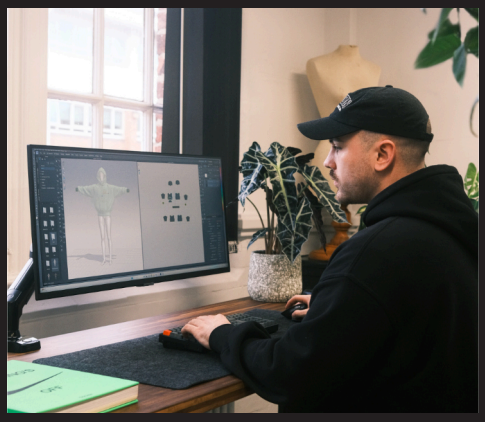
BEHIND THE CURTAIN

EXPLORING THE CREATIVE PROCESS, THE SOFTWARE ECOSYSTEM, AND THE EDUCATIONAL BACKGROUND THAT COMBINED TO CREATE THE VISUAL IDENTITY FOR THIS REPORT - AND ASKING WHAT IT ALL MEANS FOR THE FUTURE OF DIGITAL PRODUCT CREATION.



Outfit designed by Harry Tribe,
rendered in DMIx, using virtual models by DMIx / Verce.

We've become so accustomed to seeing believable 3D assets - whether they're being viewed in real-time, or as static renders in virtual product photography - that it's easy to overlook the work, the expertise, the technology ecosystem, and the hard-won skills that go into creating believable-looking digital products and outfits like the ones that illustrate the front cover and some of the internal pages of this year's DPC Report.



Harry Tribe, by Northern Made.

The Interline commissioned designer Harry Tribe, who recently graduated from the fashion programme at Teesside University in the UK, and who now runs a digital fashion service called Tribe Vision, to create these outfits to demonstrate the fidelity it's possible to achieve with accessible tools and pipelines. But we also wanted Harry's designs to showcase the tension between the demand for digital assets of this level of quality, and the complexity involved in actually creating them - great results in DPC might come easier than before, but they still don't come easy.

So join us as we pull back the curtain on the 3D design process, look at what went into creating these outfits - from education to equipment, and ask what the future looks like for young designers, seasoned creatives, and the brands that need them.

For this interview, we talk to Harry himself at length, as well as bringing in perspectives from Jaden Oh, Founder of CLO Virtual Fashion, and Gerd Willschutz, CEO of DMIx, since those two solutions made up most of Harry's software pipeline for this work. It's important to remember, though, that a wide spectrum of alternatives and different solutions exist across the DPC technology ecosystem, so we encourage every designer and every brand to find the workflow and the pipeline that fits them. The technology vendor section of this report is a great place to start.

The Interline: Tell us a bit about your history as a designer. What got you interested in fashion in the first place, and what are some of your driving design principles?

Harry Tribe: Art was a huge part of my childhood, and where I think the majority of my creative passions stem from now as an adult. I've always been into fashion - maybe without even knowing it at some points. As a child I used to pick my own outfits from as young as I can remember. And although my interest in it changed over the years, when I was 21 years old and not liking the direction my career was headed in at all, I brainstormed some dream careers and made a shortlist of some of my biggest passions. Fashion was at the top of that list, and at that point I decided to quit my job and go back to University to study how to make clothes.

Since then I've evolved tremendously, and looking back at my old designs or ideas it feels like they were designed by a different person than the one creating what I do now. But that being said, I only have 2 design principles I'm working with at the moment. I want to create clothes that get people thinking 'Wow, I can't believe he made that' or 'WTF, why would you make that?'Both of those reactions give me an equal dopamine high, and seeing the confusion on some people's faces makes all the hard work totally worth it. I think fashion is at its most powerful when it's being provocative and challenging.

The Interline: What was the catalyst that got you interested in working in 3D? Did you see someone else's renders? Did you get exposed to the tools through your education? Or did you pick up the 3D modelling bug from another hobby?

Harry Tribe: Where I studied, at Teesside University, in the UK, as part of the post COVID curriculum students are introduced to CLO3D and digital fashion in their second year of the Fashion course. Straight away I was very invested in this software and I could tell it was going to become a huge interest of mine. During my teenage years I was pretty big into gaming, and my favourite games were always the ones where you could customise your character and change what they were wearing. Using 3D design and simulation software immediately reminded me of that interest I had.

I also learned a lot about the construction of garments by learning CLO, as it uses a realistic approach to creating 3D garments. I learned so much about pattern making and sewing through 3D tools that was directly applicable to making physical clothes, so I continued to use them and learn more about some of the power user features to become a better designer and maker - not just a better 3D artist.

The Interline: How much of your current 3D skillset was picked up during your university studies, versus how much was either self-taught or acquired through other tutorials and grassroots channels?

Harry Tribe: I'd say at least 80% of my current skillset is self taught. At university - at least where I studied - you're only really taught the basic fundamentals and how to navigate the software, and you're expected to learn the rest in your own spare time if you develop the passion for it. After that module was over, I began to recreate some of my favourite collections from some of my favourite fashion designers to get some more practice in, and I

enjoyed it so much that it became a real hobby of mine. Then gradually over the course of a couple of years I became really good at working in 3D, which was extremely rewarding, but it definitely required me to commit a lot of time and effort outside of university.

The Interline: When you talk to fellow young designers, what's the prevailing sentiment around 3D? Do you find people are fully on board with the idea, sceptical of it, or even completely unaware of it?

Harry Tribe: More often than not everyone has heard of it, but most are yet to give it a go - either at all, or beyond the initial introduction they get through their education. I think because it's such a steep learning curve, people are very intimidated by it and are sticking to their guns with what they already know. But a lot of them fail to realise that just by putting in an hour a day or a few hours a week, it all adds up and becomes less and less scary (and frustrating) to use. I'm very passionate about getting people on board with digital tools, even if you don't want to go the same route as me and dedicate most of your fashion journey to it, the benefits that using 3D has on your ability to create clothing in real life is more than enough to start using it.

The Interline: What hardware and operating system setup do you use? Are you working on PC or Mac, and what CPU, GPU, and input devices make up your workspace?

Harry Tribe: I've actually just upgraded my full setup. In July I got accepted on a business course through Teesside University, where you get the opportunity to pitch to an investor for funding at the end of the course. I was successful in my business pitch and managed to secure some funding, which I used to fully kit out my setup. I upgraded to the MSI Stealth 16 Laptop, specifically the version which they collaborated with Mercedes-Benz. It's a beautiful laptop and really packs a punch. It has the Intel i9 13900H and the RTX 4070 graphics card by NVIDIA.

When choosing a laptop (or building a desktop) for CLO it's really important that you pick one with an NVIDIA RTX card as the software relies on the RTX capabilities for simulation, so providing it with that graphics card makes a hell of a difference. My current machine also has 32GB of RAM for making those files with a bunch of garments combined into a single outfit run more smoothly as ever. I've paired that up with a 32 inch Samsung ultrawide monitor, as I really think that more screen space equals more productivity - especially with CLO where you need both your 2D and 3D window open most of the time.

One piece of kit that I've recently picked up which I'm really excited about is the Logitech MX Master 3S mouse. I never expected to be this excited over a mouse but it's honestly great. It's super economic and has a bunch of extra buttons and even an extra scroll wheel which just improves workflow and productivity a lot.

I used to be a Mac user, and it was very difficult to switch over to Windows when I did a year or so back, but if you're wanting to take 3D seriously you have to be on Windows. macOS just isn't optimised for 3D fashion work right now, and you realise it's night and day when you make the switch.



Outfit designed by Harry Tribe,
rendered in DMIx, using virtual models by DMIx / Verce.



Outfit designed by Harry Tribe,
rendered in DMIx, using virtual models by DMIx / Verce.

The Interline: What did your workflow and tool pipeline look like for making the outfits you created for this report? Walk us through the end-to-end process from the initial moodboard to these final pixels.

Harry Tribe: In general, the typical way of creating garments and a collection would be to get inspiration and research from somewhere, then turn that into a moodboard to start the flow of designing. That's the way you're taught in fashion school anyway. For me it's always been a bit different. I have a really strong imagination and most of the time, I can see the final product in my head before I even start with the initial ideas. I work backwards in a way. I see the final product, and then research topics around the vision that will assist the development and make it even better. The only time I ever start with inspiration is if it's sprung upon me without going out of my way to find it.

Once the initial concept is in the works and the research is coming along nicely, I tend to head straight into CLO3D to get some design ideas brought to life. Since becoming so confident in the software, it's very rare that I start collections with sketches, simply due to how quickly I can get a super realistic, proportionate garment on a body to see immediately how it'll look IRL. There's a much shorter distance between my ideas and a visualisation of the garment when I work directly in 3D.

This sometimes has its downsides though, as I'll often give up on ideas half way through as they dont look how I imagined, rather than trusting the process to the end. Now that I think about it, I've probably lost so many great ideas that way. So the freedom to experiment digitally can backfire if you're not committing to seeing an idea all the way through.

Once everything is finalised with the garments, it's then time for me to research how the outfit will be displayed in the final render. I usually go for a studio photography style as I think that's how I can get my garments looking the best, but obviously there's a lot of flexibility in how you stage your digital garments that you don't get if you're working with physical ones.

With the addition of 3D Render by DMIx, which I used to create the final renders for The Interline, it's actually surprisingly easy to export and import the work between the two programmes. With a freshly imported GLB file from CLO, all that's left to do is choose which HQ avatar you want to use with your garments, set a camera up and you're good to go.

The Interline: To create the renders that have defined the visual identity for this year's DPC Report, the final stage of Harry's workflow was swapping out the default avatars for [virtual models](https://www.dmix.info/models/) from the library that DMIx and its partner, Verce, offer, and then using the DMIx virtual studio and cloud render pipeline to generate the realistic-looking end result. **Gerd Willschutz, CEO of DMIx**, why do you believe that giving designers like Harry easy access to ways to improve the way their designs are presented is so important?

Gerd Willschutz: At DMIx, we're committed to empowering designers with scalable tools that not only enhance their design presentation but also ensure top quality. By utilising the spectrum of Physically Based Rendering (PBR) workflow out of the DMIx library, we go beyond the limitations of real-time applications. This approach allows designers, from independent creators to large-scale brands, to achieve exceptionally high-quality, photorealistic renders. Our focus on scalability with our virtual studio and cloud render pipeline is integral to this. It democratises the design process, fostering creativity and innovation across all levels. It also aligns with the industry's shift towards sustainability, reducing physical prototyping needs and promoting an eco-friendly approach. In essence, DMIx's solutions are about elevating design presentation to its highest quality for anyone and everyone, while shaping a more dynamic, efficient, and sustainable future for fashion.

The Interline: Harry, the renders you've created for this report - with the support from the solutions we just spoke about - are obviously believable-looking . How important do you think the pursuit of fidelity and photorealism is in 3D fashion design in general?

Harry Tribe: Personally I think it's very important, but it really depends on your end goal. If you use 3D as only an aid to help with your physical fashion development, it's not really important. However, if you use digital fashion to its full potential, I think the pursuit of photorealism is very important.

Digital fashion is still currently a grey area and a lot of people still don't understand the need or want for it. But I think if you have a motive to try and blur the line between digital and physical fashion, It makes it more appealing to the average consumer, especially with visuals like the ones I created for this report. One of the biggest resources I offer to clients through my digital design practice is the ability to create extremely realistic looking renders of their garments for a fraction of what it would cost for a traditional photoshoot.And without the pursuit of photorealism, I don't think established brands would see the value in the same way, or be able to put the same level of trust in digital assets.

The Interline: Obviously you look inside fashion and towards other industries for design inspiration, but do you look at other industries - perhaps VFX or videogames - for technical best practices and modelling / texturing / rendering advice?



Outfit designed by Harry Tribe,
rendered in DMIx, using virtual models by DMIx / Verce.

Harry Tribe: Absolutely! The crossover between digital fashion and the videogame industry is massive. Every video game character needs clothing, and in most of those character design workflows a sister software of CLO3D known as Marvelous Designer is used. But it's not easy for game developers to use these softwares to their full potential because they require fashion design knowledge, which is where partnerships are born.

Then, of course, the favours are returned: I've worked with game designers to learn the basics of other 3D programmes such as Blender, as well as learning how to create my own textures using Adobe Sampler. These are tools that are increasingly making their way into fashion, but they were born and stress-tested in other industries.

As unique a discipline as 3D fashion design is, I'd encourage anyone who works in it to talk to people who use 3D tools in other sectors, because they really know what they're doing. Whenever I need any advice on hardware, or even best practices to apply to my work, I always chat to my friends in the game design industry.

The Interline: Do you believe that hybrid talent like yours - bundling fashion design and 3D design together - is something that other designers and design teams should be trying to build, or do you think specialisation is the key? In the long run, do you expect that you'll continue to put equal weight on both physical fashion design and 3D design, or are those pathways going to eventually diverge and you'll need to pick just one to develop further?

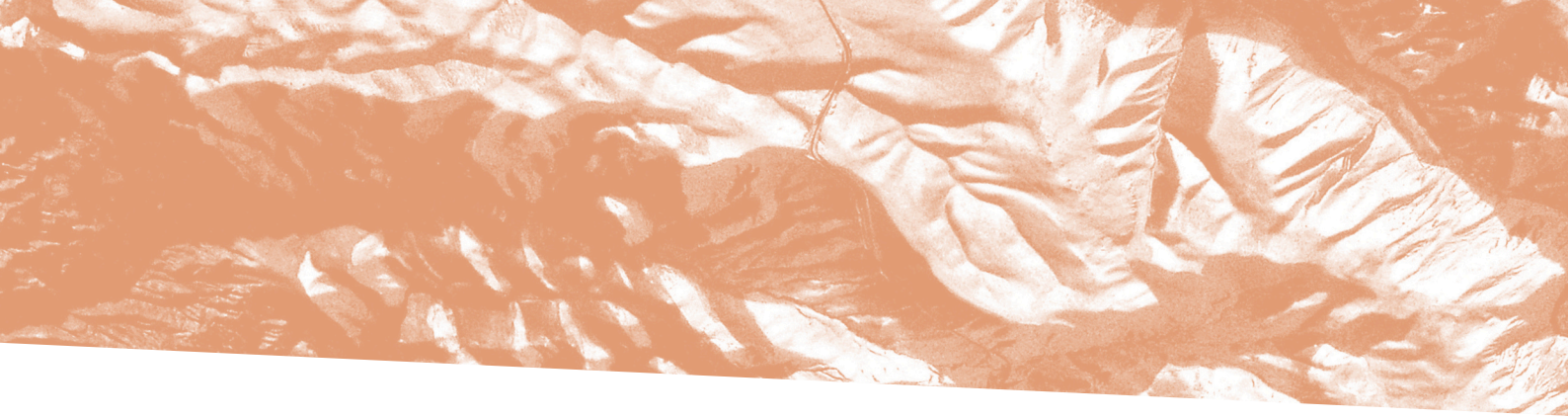
Harry Tribe: I think it's fairly difficult to put an even 50/50 on physical and digital. It is for me anyway. I always tend to fluctuate between the two, and I see them as complementing each other in a major way. When I was first introduced to 3D software, I put my all into learning it which meant I neglected making any physical garments for a while, and during that time I did debate going digital only. But the more I progressed with my degree and the more I progressed within the industry, I fell back in love with the art of sewing and making clothes again. And currently I'm enjoying being at a sewing machine more than I am at my computer… but if you ask me again in 3 months time I'll probably tell you the complete opposite!

I do believe it's important to be able to do both when you work solo like me, just to give yourself the best shot at everything you attempt, and to offer as services. For big brands, though, I can understand why there's a need to have separate tracks and separate, specialist teams of fashion designers and 3D artists, because there it's all about optimising the route to market.

The Interline: How far do you think about producibility - making 3D garments that can then be physically made - when you're working in 3D? Are you focusing on digital tools as a way to bring ideas to life that you then recreate and iterate on physically as a separate workflow, or are you prioritising pattern accuracy and material accuracy so that your 3D assets are the direct driver for making a physical garment?



Outfit designed by Harry Tribe,
rendered in DMIx, using virtual models by DMIx / Verce.



Harry Tribe: It really depends on the purpose of the 3D garment. A portion of my income as a business is selling 3D assets online where other 3D users can purchase them and use them for their own needs - whether it be for a video game character to wear, or to help with their own 3D fashion journey. In this instance, super accurate patterns and material accuracy are not the main priority, as the user can alter them anyway - and they're always listed as 'not for real production' just so the buyer knows I haven't put extra steps in to make sure the pattern is extra perfect (however when you're a perfectionist like me they're usually pretty close anyway).

On the other hand, if I'm extracting the patterns from CLO3D to use with my own brand creations, or digitally sampling garments for other brands, pattern accuracy and material accuracy are extremely important. The slightest change to a pattern can make or break it, so it needs to be perfect (or very near to) for the client right out of the software. That's the only way to actually limit the number of physical samples that get created pre production. Also, having the right digital fabric that properly represents all the characteristics of the real material, is very important, as fabric selection is so broad, and they all behave differently from each other. It wouldn't be very efficient for the client if I digitally sampled a garment in a cotton twill when they wanted it in a nylon shell, as both behave and drape very differently, which can change the look, the fit, and the performance massively.

Like everything with 3D, the intended final use case really determines how you approach things.

The Interline: When we talk about the future of digital product creation, this is a key point. **Jaden Oh, Founder of CLO Virtual Fashion**, what's your perspective on how 3D tools like CLO can serve and help to unlock all the different use cases for digital assets? Is there a common foundation that lies underneath the wide possibility space for DPC?

Jaden Oh: In a way, Harry is showing us what is possible; with the right tools and services, he can create designs and assets using software like CLO or Marvelous Designer, and market and sell those assets to users that may utilise them for a wide range of applications, including physical garments and virtual ones. For us at CLO, our goal is to build the tools and services to empower creators like Harry, as well as everyone else in the DPC pipeline. Because garment simulation technology has evolved so much in recent years, we're already at a point where brands and suppliers are making key production decisions using tools like ours. And we're continuing to build out an ecosystem of services with the likes of CLO-SET (a communication & collaboration platform) and CONNECT (a digital fashion marketplace) - so now a design created in CLO can go a lot further, and there are more ways for it to be useful. Ultimately, we envision a future where every physical garment is connected to a virtual outfit and vice versa.

The Interline: Harry, what are your feelings on digital-only fashion and digital endpoints like. videogame cosmetics and other real-time use cases? Do you believe there's a viable market for people wanting to wear digital-only clothing as themselves or as their player characters? And if so, is a digital-only designer a separate discipline from someone who designs in 3D for an eventual physical output?

Harry Tribe: This is still quite a tricky one for me. I think the consumer side of digital fashion is still too underdeveloped for it to be truly appealing to the average consumer. I think for someone to purchase digital fashion as a consumer, whether they're doing it for sustainability reasons, or to have more options for what to wear in their instagram posts, or even to "wear" in one of the platforms that hold themselves out as being "the metaverse" , I think they have to be *really* into fashion and *really* into quirky tech. And even then I still see it as a bit of a fad, and something they wouldn't repeatedly return to,and I think The Interline's breakdown of the second Metaverse Fashion Week earlier this year did a decent job of explaining the reasons for that.

Right now, I just can't see the average social media user or the typical fashion buyer even debating buying any form of digital fashion for their own personal use. I do think, though, that once digital fashion becomes a lot more accessible (which is something some big brands are working hard on) and easier to use then it might be a different story, but for now I don't see it as something everyone will be jumping on.

And in terms of digital-only designers, there's a lot of creativity in that space, but I think it's definitely a different discipline. Don't get me wrong, a lot of knowledge is linked between digital and physical fashion; like I said earlier I learned a lot about creating physical fashion through spending so much time on digital. And although it takes years and years to master digital fashion as the software is so incredibly complicated and in-depth, sewing is even harder.

For example, when creating digital fashion, you use the sewing tool to sew two seams together and as long as your measurements are okay, there isn't really any way it can look bad. However, with physical fashion and sewing, it takes a lot of skill to be able to sew in a straight line nice and neat and to make it presentable enough to be sold. And a lot of things in digital fashion are very easy to apply once you know how, such as adding zips and buttons etc - but it's just not that simple on a sewing machine.

The Interline: If you could talk to a roomful of designers - whether they're new graduates or established designers who've so far stuck to 2D workflows - who haven't experimented with 3D, what advice would you give them?

Harry Tribe: The future is here. You can be a part of it or you can be left behind. Technology is not here to replace you unless you refuse to engage with it - it's here to assist you. Nothing can ever replace the true craftsmanship of a designer and maker, but neglecting opportunities that will make your life so much easier, make your brand more sustainable and save you money in the long run is silly.

Pretty much every single job in the fashion design industry now requires you to know about and interact with either the tools or the output of core digital product creation software like CLO3D, Browzwear, Style3D, Optitex etc., or extended DPC-ecosystem tools that cover material digitisation, avatars, cloud rendering and so on. It might seem extremely daunting at first, but practice makes perfect as always, and even spending a few hours a week will eventually add up to you being better-equipped to work in an industry where 3D and DPC tools are driving a lot of the innovation.

To see more from Harry and his Tribe Vision service company, visit his Instagram page, his CLO-SET portfolio, and his website. He can also be reached on LinkedIn.

For more on CLO, DMIx, and the wider ecosystem of DPC solutions, visit the technology listings section of this report.

Outfit designed by Harry Tribe, rendered in DMIx, using virtual models by DMIx / Verce.



IMAGES PROVIDED BY TIMBERLAND DPC TEAM.

SCALING DIGITAL CREATIVITY: A BOTTOM-UP APPROACH TO DIGITAL PRODUCT CREATION

MIRRORING A WIDER SHIFT FROM TOP-DOWN TECHNOLOGY DEPLOYMENTS TO GRASSROOTS, PROCESS-DRIVEN PROJECTS, SUCCESS IN SCALING AND EXTENDING DPC WILL ONLY BE SECURED WITH THE BUY-IN OF A BROAD SPECTRUM OF DIFFERENT TEAMS, JOB ROLES, AND DISCIPLINES.



BY SYLWIA SZYMCZYK, 3D APPAREL SPECIALIST, TIMBERLAND

Sylwia Szymczyk is a dynamic and passionate 3D Fashion technology expert and keynote speaker from Timberland, a VF company, who simplifies and teaches complex technological concepts in fashion innovation. Her presentations share a deep understanding of stakeholder needs and build desire to create change in fashion. Sylwia has 15+ years of experience working with major fashion powerhouses like Armani, Max Mara Fashion Group and VF corporation. She is passionate about driving innovation in fashion through harnessing the power of people, collaborations and partnerships.

The fashion industry is on the brink of a complete digital overhaul, spearheaded by Digital Product Creation (DPC). This shift will require a hybrid blend of digital technology and traditional fashion practices, and its objective is to open up new avenues in design, manufacturing, and consumer interaction.

However, moving towards a digital-focused approach is complex. Even as it builds on long-held, traditional fashion skills, it requires a well-thought-out strategy to incorporate cutting-edge digital tools and digital assets - one that favours a bottom-up collaborative approach over top-down directives.

The core of this approach is going to lie in involving end-users - the people who will use these digital tools daily - ensuring that the technology that gets

adopted, and the processes that are changed as a result, all aligns well with the real needs and operational realities of stakeholders in design, development, sourcing, sales, marketing, and a range of other disciplines. .

But how can a brand or retail business actually put a bottom-up approach to DPC into practice? How can engaging end-users tie into the broader digital strategy in a way that promotes scalability and innovation? And as fashion brands step even further into the digital realm with virtual photography, real-time rendering, AR / VR experiences and more, how can they ensure that the digital tools and assets deployed across the value chain enhance, rather than hinder, creativity and efficiency?

Based on my own first-hand experience, I wanted to explore the strategic and human-centric principles that I believe will be essential for successfully integrating and scaling Digital Product Creation in fashion. And I wanted to lay out an industry roadmap towards not just greater adoption of DPC, but greater realisation of value from it.

The Imperative For Bottom-Up Digitalization

In fashion, drives towards digital transformation have typically been led by top-down strategies and edicts from senior management. This approach, however, can end up overlooking the unique requirements of individual departments.

A more impactful method is empowering department heads and process experts to lead DPC initiatives based on their real-world experience, and to give those subject matter experts and champions the ability to influence everything from scoping and solution selection to training and extension.

Industry data demonstrates that brands with a completely digitalised value chain generally perform better, as compared to companies that have approached the same challenge through a narrower lens, landing them with a more fragmented digital estate.

For DPC to scale effectively, then, it's crucial to involve end-users when choosing tools and forming and formalising digital strategies. Their practical experience and insights are key to finding digital tools that address real challenges at different, discrete stages of the value chain. Additionally, having a well-planned integration framework is important. It creates a smooth workflow that reduces hurdles, boosts productivity, and encourages a culture of continuous improvement.

So the goal is not, in this hybrid world, to treat traditional expertise and digital skills as independent entities. And neither is it to compartmentalise the deployment of digital tools in individual process areas. Instead, fashion organisations should be aiming to envision a broad-scale transformation of their entire value chain, and then to separate it into individual areas where a stand-alone return on investment can be realised, but where a compounded ROI occurs when those areas are integrated with one another.

A prime example of this is seen in cross-departmental pilot projects. In these projects, teams from different departments collaborate on the digital transformation of a specific product line, such as casual wear or sportswear. The project typically starts with a small group, perhaps in the design department, using digital tools for initial concepts and prototypes. This small-scale implementation allows for quick feedback and iterative improvements. Successes and lessons learned are then shared across departments, from production to marketing, gradually scaling the digital process.

This collaborative, bottom-up approach not only streamlines the digital transition but also significantly improves operational efficiency as well as contributing to better product outcomes across newness, trend, quality, fit, and much more.



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These kinds of pilot projects are where many brands begin their DPC journeys, and they can serve as a model for broader digital adoption, demonstrating how gradual, inclusive strategies can lead to successful digital integration. But at the same time, these pilot projects are also often where DPC strategies stall; there are many brand and retail businesses who were successful in rolling out 3D tools to their design and development teams, for example, but far fewer who were then able to extend the benefits of that roll-out into production, sales, marketing, and other business units.

Implementing Digital Product Creation as a business-wide mindset and culture change, then, is an evolving process that thrives on regular feedback and continuous adaptation - not treating isolated applications as the end of the journey, but as individual steps towards a much broader horizon.

This method requires that strategies stay aligned with team requirements in individual areas (something that is only possible with the direct participation and ongoing engagement of those specific teams) and also helps shift wider workplace culture towards more modern practices - whether those sit in sourcing and sustainability, or in fit simulation, costing, eCommerce, or a large spectrum of other use cases.

Key to this transformation is the involvement of employees. When they actively participate and their insights are valued, it minimises resistance and cultivates a supportive, collaborative environment - a requirement when a technology initiative is as all-encompassing as digital product creation has become.

The DPC initiative also requires rethinking existing processes, often leading to a complete revamp of traditional methods that needs to take place either alongside the existing development calendar, or in the small brackets of time that are available between cycles. Adopting a measured, Minimum Viable Product (MVP) approach allows for a gradual and potentially more effective transition, since it removes the need for all work to aim for a single cut-off and go-live date by which every functional elements and every desired capability must be in place.

Simultaneously, enhancing cooperation with supply chain vendors and shifting from a top-down to a more flexible bottom-up strategy encourages creativity and collective effort. It is easy to frame digital product creation initiatives as being brand-first in both their requirements and their value, but the reality is that the most successful transitions have been value-chain-wide, since many of the world's best-known brands rely on their vendors for both physical and digital production support.

Supermind And Open Innovation

Thomas Malone's concept of Superminds describes a powerful synergy between human and machine intelligence. It suggests that when human cognitive abilities are combined with the computational power of machines, the resulting 'supermind' is more capable than



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either on its own. This fusion is particularly significant in the context of DPC strategies and open innovation, since human creativity and machine calculations are being paired to accelerate a workflow that was otherwise entirely manual.

Automation has the potential to take over routine, repetitive tasks as a result of enterprise-wide adoption of DPC, thereby freeing human minds to focus on more complex aspects of fashion design and production - aided by 3D tools, digital assets, and the collaboration they unlock. This allocation of tasks allows human talent to engage more deeply in areas where they excel — creativity, critical thinking, and nuanced decision-making.

Pairing the Superminds concept with open innovation can also lead to a potent mix. Open innovation refers to the process of embracing external ideas and technologies, as well as internal ones, in the pursuit of advanced solutions. When Superminds are applied within an open innovation framework, it can create a collaborative ecosystem. This environment is ripe for innovative thinking and problem-solving, as it harnesses a diverse range of perspectives and skills - precisely the kind of approach that has been demonstrated to drive the best results in bottom-up DPC strategies.

For instance, a fashion company might organise an internal contest to identify areas where technology can solve common challenges - especially where those are based on the brand now having digital twins of their materials, components, products, and even their supply chains.

Working from this new digital foundation, employees across departments could then be encouraged to propose solutions that combine their expertise with technologies like AI or 3D. One team might suggest using AI for trend analysis to assist designers, for instance, while another could advocate for 3D modelling to improve garment fitting and then using AI for grading directly on avatars. These ideas can be tested through pilot projects and, if successful, integrated into the company's broader DPC strategy.



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This approach not only solves immediate operational issues but also fosters a culture of innovation, showing how the synergy of human and machine intelligence can drive the evolution of the fashion industry - just as it has when we shifted from designing on paper to borrowing best practices and CAD tools from other sectors.

Cultivating A Growth Mindset And Embracing Authentic Leadership

But moving towards a digital and scalable DPC framework isn't just about technical or strategic changes. It's also about (re)shaping the culture within the organisation, encouraging a growth mindset among teams. A growth mindset means being eager to learn, staying strong when faced with challenges, and always striving to improve.

For success in scaling DPC, it's vital to encourage this growth mindset, and to emphasise how having access to virtual prototypes, having the ability to drastically shorten the time between initial idea and visualisation, or having access to a common language and a tool for collaboration and accountability with suppliers, can change the way individual people think about growth.

With the right foundations, a bottom-up DPC strategy - properly integrated - can then help teams to step out of their comfort zones, explore new ideas, and adapt quickly to digital changes. This could create a culture where mistakes are seen as learning opportunities, and success is a shared achievement.

At the same time, the role of leadership changes significantly when new initiatives and new ideas rise up from the grassroots and are allowed to germinate and grow. Effective leaders in this digital era are those who can motivate their teams to strive for excellence, and who focus on what more can be accomplished once digital tools and digital assets are in place..

In the DPC world, good leaders share their knowledge and promote a culture of teamwork and ongoing improvement. They spark curiosity, drive, and excellence in their teams, pushing the organisation forward in the digital journey. This kind of leadership provides a strong foundation for innovative thinking, problem-solving, and smooth adoption of digital tools and methods.

Together, a growth mindset and strong leadership drive the progress towards scaling DPC. This combination not only propels the digital transformation forward but also builds a resilient, innovative, and collaborative culture within the organisation, which is crucial for success in the digital era of the fashion industry.

The ADKAR Model And Change Management

Navigating the shift to digital comes with its fair share of resistance and hurdles. Here, the ADKAR model (which stands for Awareness, Desire, Knowledge, Ability, Reinforcement) can, in my experience, provide a solid framework to manage this change. It helps create a favourable environment for end-users to adopt new digital tools while reducing resistance. The steps of the ADKAR model serve as guiding markers, helping the organisation move through the rough patches of change towards successful digital adoption and improved efficiency.

In this scenario, using a framework like ADKAR is essential to handle the human side of change. However, it's also important to go beyond just structured frameworks and include employees in the change process by valuing their ideas and feedback. When employees see their ideas being considered, and when they are actively involved in shaping the plan, they are more likely to move from resisting the change to accepting and actively participating in it. They go from being mere spectators to active players in the change process.

ROI Through End-To-End Implementation

Discussing Return on Investment (ROI) in DPC extends beyond theoretical concepts; there is a lot of debate in fashion about what digital transformation truly looks like, and how brands will need to take advantage of new channels, new mediums, and new frontiers. But the practical reality matters more in the short term, and a robust DPC strategy is one that prioritises the employment digital tools that deliver quantifiable value today, and that go on to synergise and evolve across the value chain.

Reflecting on the earlier example of cross-departmental pilot projects, these initiatives can be seen as early victories that demonstrate the economic viability and ROI of such strategies once they are scaled. For instance, a pilot project focusing on a specific product line like activewear can yield tangible results. When these projects are scaled up, they often lead to significant financial gains. A study supports this, indicating revenue increases of 9% to 25% and cost reductions of 8% to 28% with the expansion of digital solutions. These figures underscore the financial advantages of a well-executed, bottom-up DPC strategy, highlighting its potential not just for cost savings but also for revenue growth.

To achieve ROI in Digital Product Creation, a brand must adopt an adaptable strategy that accommodates new tools and technological advancements while aligning with its operational practices and strategic goals.

> "INDUSTRY DATA DEMONSTRATES THAT BRANDS WITH A COMPLETELY DIGITALISED VALUE CHAIN GENERALLY PERFORM BETTER."

This approach doesn't mean indiscriminately adopting every new tool; rather, it involves a careful selection of technologies that specifically address the brand's unique challenges and opportunities. This methodology highlights the value of pilot projects as platforms for testing innovative solutions and demonstrating the practical ROI achievable through a well-planned digital transformation.

Conclusion

As fashion embraces digital product creation as an enterprise-wide transformation, instead of a standalone project confined to design and development processes, a bottom-up approach is, I believe, going to be the key to realising the wider value that exists beyond digital sampling, or beyond replacing product photography. While a long-term viewpoint and executive sponsorship matter a great deal, the most important currency here and now is the first-hand knowledge, expertise, and talent of the people who will be tasked with using 3D and DPC tools to change their own slice of the value chain in a way that benefits the stakeholders whose work comes after theirs.

This strategy ensures that technology integration and selection are driven by practical user insights, contributing to the growth of a digital ecosystem that resonates with the unique demands of different job roles, specialisms, and perspectives. The goal is to create a digital space that not only adapts to but also enhances the industry's creativity and innovation - and to score that goal, everyone in the industry must be aligned in a common direction.



IMAGE PROVIDED BY TIMBERLAND DPC TEAM.



THE UNTAPPED POTENTIAL OF DIGITAL MATERIALS AND SOFT AVATARS IN DPC

THERE ARE CURRENTLY TWO IMPORTANT MISSING LINKS IN THE VISION FOR DIGITAL PRODUCT CREATION. THESE ELEMENTS WILL BE ESSENTIAL FOR END-TO-END USE OF DIGITAL ASSETS, AND THE TIER 01 AND 02 SUPPLY CHAIN HAS A HUGE ROLE TO PLAY IN CAPTURING THESE OPPORTUNITIES.

Noyon Lanka, MAS' knitted lace division



ANUPAMA FERNANDO, SENIOR DIGITAL EVANGELIST – LEAD DPC MAS HOLDINGS

Anupama leads the DPC team at MAS Holdings managing a portfolio of DPC and adjacent digital capabilities for group. She specializes in executing strategy, managing change, and inspiring teams on what technology can do to make their lives better.



HASINI WEERASINGHE, SENIOR ASSOCIATE DIGITAL EVANGELIST – TECHNICAL PROJECT LEAD DPC

Hasini manages technical DPC initiatives across MAS apparel and supply chain teams. She leverages her expertise in physical product & textile knowledge to bridge the gap in what technology can do to solve practical problems in product and material creation.

In the post-pandemic era, the role of Digital Product Creation (DPC) has transcended its initial position as a mere tool for visualisation - becoming a pivotal force in digital decision-making across product design and development. And in the face of economic challenges, companies using DPC tools are now in the process of figuring out the optimal strategies to extend the capabilities of 3D simulation, digital materials, and other ecosystem solutions to drive a more profound impact through the creation and use of true digital twins (DTs).

The hallmark of digital garments – the element people always talk about when 3D and DPC topics are raised - is their unparalleled speed and flexibility, but can this efficiency be harnessed with only selected stages in the value chain? Or, to put it another way, will the real value of digital product creation be unlocked by focusing on just design, prototyping and colour? And if not, what else is going to be required to reach that stage of having a genuine digital twin that can create value at every step of the route to market?

While significant strides have been made in mature DPC capabilities for product development and sales, a crucial question arises: can End-to-End (E2E) DPC truly be achieved without considering a vital stage – fitting? Another space that prompts reflection, when we think about the vision for digital twins, is true role of fabric suppliers. Should their contribution extend beyond providing digitised materials and into these additional stages where their expertise could make the difference between a digital asset and a genuine digital twin?

Based on our first-hand experience, this article aims to uncover the untapped reservoir of extended DPC capabilities within the full value chain, identify any missing elements, and providing tips on how to tap into these in service of creating a workflow that's built on top of digital twins.

It's Time To Bring The Tier 2 Supply Chain Onboard

The real value of speed is realised when digital assets move across the value chain faster than their physical counterparts could. So while a lot of brand strategies have been focused on beginning DPC from garment creation, why not explore what can be done at the fabric stage, by the teams that are directly working on material development? The capabilities are still developing, but the potential for transformative improvements is real.

Consider the time saving alone: fabric development is a far more time and cost-consuming process compared to garment development. More often than not, lack of flexibility in the fabric part of the supply chain is what limits brands from reacting to market changes in-season. Introducing the concept of digital twins for fabrics can be a significant unlock for all partners in the value chain, because it can directly influence the root causes for delays in speed to market, excessive costs, and lower agility.

While the scanning throughput of materials to create digital twins has exponentially increased, this has been primarily a value-add for brands and manufacturers – not a



MATRIX, MAS' flat knit division.

radical transformation. Faster and better scanning can expedite one part of the process, but makes little dent in the whole. Why? The cost and time of the material has already been incurred at the point of cutting a small swatch of the physical yardage for scanning. Just like the design and development stage, where early experimentation and visualisation are the key to both smart decision-making and time, cost, and sustainability improvements, value for fabric suppliers comes from having the ability to digitally create fabrics for use in the early sampling stages. Once fabric concepts are approved, scanning them then creates even deeper value in terms of replacing the need for physical catalogue or even sending sample yardage for garment sampling. These two approaches can complement each other in various stages of the fabric development calendar.

Sketch / Simulation To 3D

Imagine using a sketch from a lace design or a simulation from a drafting process to create a visually accurate digital material. Traditional lace making, which typically takes 3 to 6 weeks, can be significantly expedited through digital processes.

Today, a combination of DPC and adjacent tools allows the creation of lifelike material visuals in both traditional and engineered fabrics and for those visualisations to be used during the for ideation/concept stages, enabling digital decision-making well before physical samples are produced.

This approach extends beyond laces and can be applied to different types of materials. For example, using 3D knitting software, early digital samples can be developed and later integrated into garment prototyping software for full product visualisation. Preserving the authenticity of digital garments is most effectively achieved when development occurs at the source, and in this case, the source is the fabric supplier, who understands how the digital material should look and "feel" like.

More often than not, the complete seasonal collection that suppliers launch doesn't always make it to sampling in full. Certain designs are left without a physical sample and only an artwork/sketch as a visual aid. Digital twins can come in handy for these occasions, offering a bridge between the sketch and the physical sample.

Is Fitting 3D In Truly Possible Today?

A digital sample with right foundational capabilities can move as much as 50%- 60% faster than the physical sampling process. But this level of speed cannot be unlocked through just one or two rounds of sampling. At times, the first round of Digital Twin (DT) might actually be slower than physical sampling considering the effort that needs to be front-loaded, such as material digitization & 3D garment creation. So where do those time savings actually come from? As the DT moves across the value chain, the work put in at the earliest stages (by suppliers and by their brand customers) has compounded benefits, and the incremental effort is comparatively less. A DT follows an additive process, whereas a physical sample is built all over again at every sampling need. As the need for digital sampling grows, the speed of the overall workflow can pick up drastically.

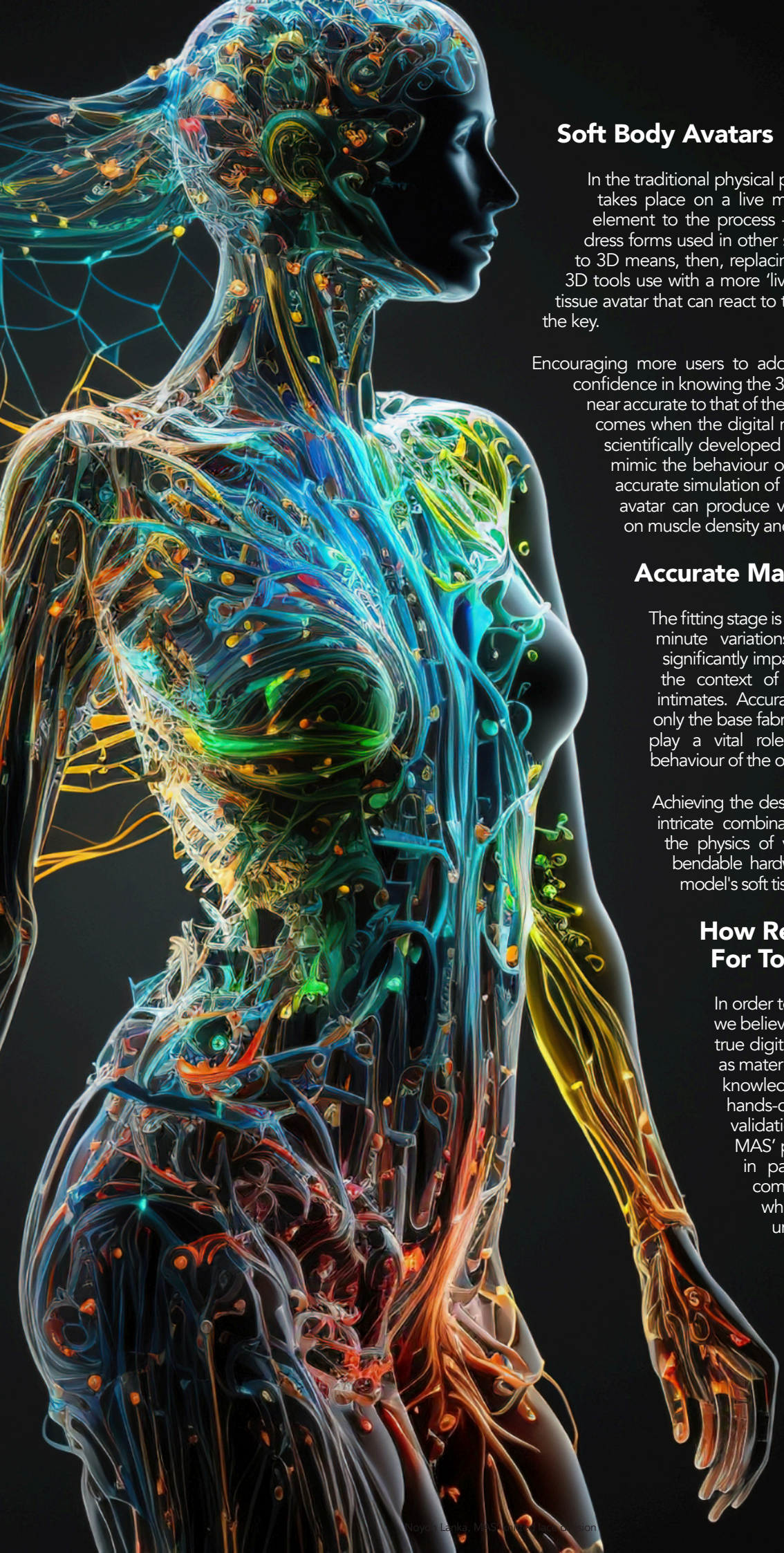
But despite the numerous advantages, the fitting stage is frequently bypassed in digital garment creation. Unlike other stages, making decisions digitally about the fit of a garment involves more than just using available functionalities in the 3D tools. To transition effectively to digital fitting, contemporary 3D software necessitates several new upgrades such as an accurate soft tissue simulation and properties of all types of materials and stitches, ensuring a more authentic and realistic representation in the digital fitting stage.



Noyon Lanka, MAS' knitted lace division



Noyon Lanka, MAS' knitted lace division



Soft Body Avatars

In the traditional physical process, the fitting stage often takes place on a live model, introducing a dynamic element to the process – a departure from the fixed dress forms used in other stages. Migrating this process to 3D means, then, replacing the hard body avatars that 3D tools use with a more 'living', model-like avatar. A soft tissue avatar that can react to the pressure of the garment is the key.

Encouraging more users to adopt digital fit comes through confidence in knowing the 3D simulation of the digital fit is near accurate to that of the physical twin. This confidence comes when the digital model is a representation of a scientifically developed and validated avatar that can mimic the behaviour of a live physical model. Such accurate simulation of a garment fit comes when the avatar can produce varied tissue behaviour based on muscle density and location.

Accurate Material Properties

The fitting stage is all about precision, where even minute variations of a few millimetres can significantly impact the outcome, particularly in the context of close-to-body garments like intimates. Accurate material properties of not only the base fabrics but also seams and stitches play a vital role in simulating the accurate behaviour of the overall garment.

Achieving the desired fit on a model involves an intricate combination of garment construction, the physics of various materials and stitches, bendable hardware and consideration of the model's soft tissue.

How Ready Is 3D Fitting For Today's Work?

In order to successfully unlock digital fit, we believe accurate soft avatars that is a true digital twin of the fit model as well as material physics play a vital role. Our knowledge shared here is based on hands-on and industry benchmarked validation work being conducted by MAS' product development experts, in partnership with a technology company, to understand and verify what it would take to finally unlock the ability to fit in 3D. Our extensive experiments, conducted for over 2 years, included validating a curated set of garments worn by a live model and her scanned digital

body against fit measurements/visual fit appearance and pressure, which provided us with the insights needed to confidently understand what is required launch fitting in 3D. While technology can always evolve to provide further value, we see that the results of our experiments are proving to be promising, and they are allowing our teams to launch pilots with our brand partners to bring this officially to the industry. The technology will evolve with more early adopters taking part in experiments and sharing feedback that comes from running continuous experiments. We hope the work we are soon to conclude and share openly with the industry will give insightful learnings to fellow early adopters to explore how digital fit can be a part of their DPC journey.

Value Beyond The Physical Process

The major pitfall in relying on digital tools is confining their benefits to just creating replicas of pre-existing, narrow physical processes. Digital tools offer a broader horizon, presenting possibilities beyond replicating traditional methods in a digital format. Digital fit unlocks opportunities unattainable through physical processes, such as moving away from the need for calibrated models to the exact digital version of a model that becomes a universal fitting standard across suppliers, ensuring consistency. This also unlocks opportunity to maintain fit consistency across traditionally challenging models such as kids, maternity, different-abled, and plus-size as live models may change shape or not every vendor might be able to find the models as easily.

Digital avatars introduce a scientific and standardized approach to fitting, mitigating the subjectivity associated with model feedback. Moreover, it facilitates benchmarking fits across sizes and product ranges, empowering brands and vendors to make decisions concurrently on multiple digital models, a capability previously unattainable. Being able to scientifically quantify fit, which can become a standardised way of interpreting comfort can create a game changing opportunity in the product development realm.



Noyon Lanka, MAS' knitted lace division



THE DIGITAL THREAD: CONNECTING VIRTUAL REALITY, AUGMENTED REALITY, AND 3D

DIGITAL PRODUCT CREATION STRATEGIES CAN GET THEIR START IN UNLIKELY WAYS, OUTSIDE THE TRADITIONAL CONFINES OF DESIGN AND DEVELOPMENT. BUT WHEREVER THEY BEGIN, THE TARGET OUTCOME IS THE SAME: VALUE THAT STRETCHES UP AND DOWNSTREAM, AND TRANSFORMATION THAT CAN TRANSCEND DIFFERENT MEDIUMS.



BY MACKENZIE DELEV, DIGITAL PRODUCT CREATION STRATEGIST

A Digital Product Creation Strategist, Mackenzie is skilled at driving the development and transformation of new and existing products to scale growth. She has a track record of success in collaborating with subject matter experts and cross-functional resources to deliver high-quality products.

Digital Product Creation (DPC) in fashion and retail has come a long way, transforming the way we think about design, product development, manufacturing, and forging new links between them all. But as the industry has focused on using 3D and DPC tools to align different departments, another digital thread has also been coming together - connecting 3D to virtual reality (VR) and augmented reality (AR).

That's a thread I've seen develop first-hand. So let me tell you how I became part of the DPC community in a different way to most designers and developers, and why my work experience - which included managing the DPC strategy roadmap and developing the 3D pipeline for a large mass manufacturer - has led me to the conclusion that the power of 3D assets lies as much in bridging different experiences and mediums as it does in helping different teams work better together.

Five summers ago, I started a dream internship for a Fortune 500 company as a Global Learning and Development Intern in HR. Not exactly the typical place that brands find their intake of 3D and DPC professionals!

At the end of my 3-month internship, I was tasked with presenting an internship project to my department. The only direction I was given was to create a unique project to train employees in a different way. I brainstormed and hit on the idea of both streamlining and transforming the way the company trained its high-turnover individuals: seasonal store employees. The plan was to do this in a way that retained the corporate store learnings from season to season (typically they'd get reset during the annual churn) and to allow new associates to be upskilled as quickly as possible, because they worked during the company's most profitable times of the year, and downtime spent training would directly translate into time lost on the retail floor.

I spoke to long-tenured store employees and asked them what skills were in the shortest supply and were the most critical to success during the holidays. The answer was merchandising and in-store consumer engagement. At the time, these skills were being taught afresh every season, in an ad-hoc way - without any real visual, structured learning, and without a real yardstick to measure skill mastery against.



This was the key: I realised that the issue was not just the method, but the medium. So I hit on the idea of challenging both, and I decided to try using 3D assets and environments to create both augmented and virtual reality experiences to train employees in the most immersive way I thought possible.

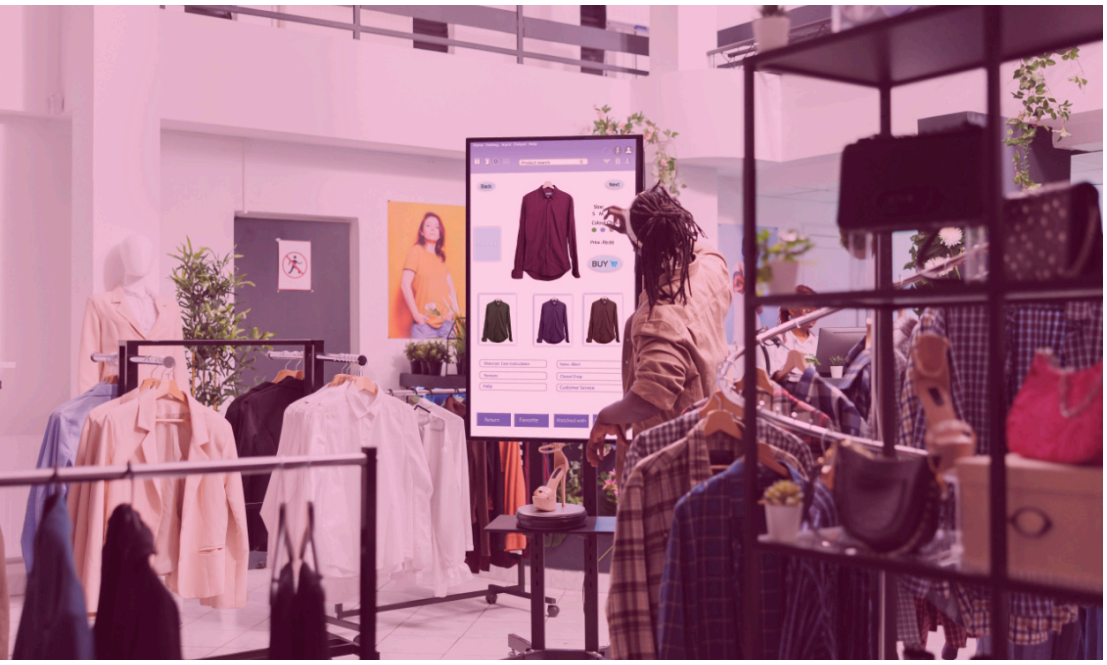
"How hard could this be?" I thought. "Surely there are off-the-shelf tools that will make it straightforward to build immersive experiences, so I'll self-teach these technologies and build out an immersive training experience!"

In practice, it wasn't quite that easy. But over time I built a prototype to gamify VR as a tool for teaching in-store merchandising training more effectively, which led to a 60% increase in retained information over traditional methods. After that, I was asked to stay on longer as an HR intern to expand on this concept , which led to us later developing a VR tour around HQ to attract new talent.

Again: not exactly the typical route to digital product creation, but hopefully you can see where this is all leading!

Eventually, I got the opportunity to present both the training project and the headquarters tour to the company CEO. In a short presentation, I needed to quickly cover how these digital, immersive experiences could be more cost effective, more scalable, easier to remotely deploy, more customisable, and quite a lot more.

Back then, I believed this was the right direction for the talent-facing work the company needed to do, but I fully expected the CEO to tell me "we're not a software business" - which is something I know a lot of people in fashion have heard before when they've had the opportunity to pitch new tech-enabled and tech-adjacent ideas.



After the presentation ended, though, he offered me a job which I grew into a career - and that wound up being the seed that turned into a full DPC strategy at the company.

Creating Digital Product Creation In Reverse

Unlike a lot of organisations, where DPC initiatives begin (and sometimes end) in design and development, we had the challenge and the opportunity of working backwards. We'd already tested and proven the idea of putting people into immersive, real-time experiences where 3D assets stood in for real products, so now we needed to figure out how to scale the creation of those digital products in away that served all the brand's audiences: product creators, suppliers, and the store planners, associates, and even consumers all the way downstream.

Digital product creation is a huge undertaking for any organisation. And we quickly realised that the only way for a large company with multiple brands and different product categories to succeed was to lay a scalable foundation.

By moving from HR and into design and development, the fledgling DPC team also found ourselves in the middle of a digital transformation and change management journey, since we were suddenly not just training people, but changing everyone's way of working.

That realisation was also an important unlock in the way we thought about both designing and prototyping digital products, and the technology ecosystem we wanted to build. We wanted to be agile and future-proof, so that meant building a scalable, interchangeable pipeline that wasn't contingent on specific file types or tied to individual vendors.

We also thought deeply about what happens to digital products once they're created, and this was where we took the learnings from the immersive experiences we'd created for in-store teams and new hires, and thought about how those different mediums could change the way other people in the value chain worked.

Virtual reality, it emerged, provided a platform for immersive, lifelike experiences that could add an extra layer to the design and prototyping phases: if you're working with 3D garments or accessories, why not view them in the most hands-on way you can get without making a physical prototype? 3D itself, of course, was the engine that drove the creation of those digital products, but we set out to really push the envelope on realism and customisation - not just so our in-house teams could see new styles, but so our customers could bring them to life in shopper-facing AR experiences at home and in-store.



"The issue was not just the method, but the medium."





In my experience, brands and retailers tend to think about these different mediums as separate projects - possibilities that get opened up by 3D assets, but that aren't treated as part of DPC. Instead, I think it's going to be important for fashion to take advantage of all three together seamlessly to create a stable pipeline for your entire value chain.

Taking DPC Upstream

Let's consider the supply chain perspective. When used all together, these technologies have the potential to streamline production processes, reduce lead times, and minimise the risk of costly errors. They also can empower your vendor factories to experiment with prototypes and concepts more freely, without the need for physical prototypes. And while everyone talks about collaborating with their partners on another continent through solutions like PLM, there's no substitute for doing it in a real-time, immersive way.

This isn't just theory: in the use cases I helped develop, we used 3D to create digital twins of physical products in partnership with our manufacturers - which translated into higher efficiency and lower production costs. Then we used the product measurements to build an AR app to scan bodies and create 3D avatars of the individual, and suggest sizing.

We also used 3D prototypes created by our manufacturers for sales meetings when the physical prototypes were not available in time. We actually used VR to educate leadership and to demonstrate first-hand how we could run sales meetings through these immersive experiences, without needing to bring real prototypes and real people into the same space. And in turn, that secured more executive sponsorship that gave us the funding to continue developing our DPC strategy, and to extend the use of VR into sharing new SMU lines with smaller retail customers.

Unlike a lot of fashion brands, we also had the added benefit of being largely vertically integrated - where a majority of steps in the global supply chain were wholly owned. This translated into a significant edge during COVID, since it allowed the organisation to switch out parts and build elasticity into its production capacity - to keep costs down and to stay agile.

But the first-party supply chain was also where we saw one of our biggest opportunities for greenfield processes - challenging the foundations of the way we worked, and re-evaluating best practices. If we allowed these processes to be replaced with 3D, VR, and AR, we could enable even greater vertical integration, allowing us as a retailer to be successful by owning design, product development, and manufacturing in-house.

Confining DPC to design and tech design, in my experience, internally limits informed decision making. But using the output of those processes in VR or mixed reality changes this. The relatively simple act of taking a digital asset out of the design and development box and placing it - and the people who need to interact with it and influence its route to market - into a shared, 3D experience can break down silos and get everyone closer to that fabled "one source of truth".



And again, this isn't just wishful thinking. We saw the use of AR and VR not only shorten the production cycle, but also provide better control over the quality of the final product.

As an example of the same principle deployed elsewhere upstream: in our distribution centres we used AR glasses to help guide picking of orders. To do this we created a virtual map of the environment, including all digital objects such as aisles and product locations on those aisles, that was laid over the real warehouse environment. Using the location and sensors on the AR glasses, we projected directions to the location of the items needing picking, then the user would have to scan the product and place it in the shipping bag. The result was quicker pick times, lower initial training time, and less room for error.

Building A Vendor-Agnostic Ecosystem

I'm aware that I've painted a very positive picture of the ideal vision for extending the value of 3D assets into new mediums and new experiences, but that wide-scale adoption of VR, AR, and 3D in retail is certainly not without its challenges.

It was, to put it mildly, a struggle to find comprehensive solutions to integrate these technologies seamlessly into our supply chains. And this is something I know a lot of brands, retailers, and their partners are finding: the leap from digital design to a true digital twin, and an all-digital, end-to-end workflow is not going to be an easy one to make, whether you're approaching it through the lens of design and development, or the creation of immersive experiences for your different stakeholders.

Technology vendors will need to play a critical role in this transition by offering adaptable and open platforms that cater to the diverse needs of retailers and brands - especially in cases of mass manufacturing and multi-category businesses, where the value chain is made up of a broad spectrum of different vendors and suppliers, with different specialisations.

I think the mandate from industry is clear. Organisations want the simplest solution, and they want the ability to extend the capabilities of that solution without needing to start from scratch with new RFPs., They also want to work with open APIs rather than needing bespoke integrations, and they want file types that are cross-compatible. Organisations want no hidden costs, and technology should give them the most control and visibility over their supply chain not through brute force, but by making it as easy as possible to onboard upstream users. Critically, a multi-vendor ecosystem must be compatible with all forms of reality - augmented, virtual, mixed - to extend that digital thread further through the ecosystem and to help break down silos.

Technology vendors who work to enable cross-functional collaboration, and who offer customisable solutions, can empower retailers to harness the full potential of the digital thread and achieve a competitive edge. Those are the vendors that organisations are choosing to partner with to form a strong, standardised and scalable foundation for DPC.

As a case in point: I've seen the strides that Browzwear has made towards open standards and APIs, and that position has helped them to become a strong partner for a lot of organisations, because they're not just building their own functionality (like the line-sharing capabilities in their StyleZone solution) but also taken an open stance to integrations and interoperability so that their own products fit into the wider DPC landscape.

And there's a lot in store on the horizon of that landscape, such as AI-driven design, blockchain integration for transparent supply chains, and even more immersive customer experiences. Retailers that keep an open pipeline and can evolve quickly to digital changes, stand the best chance of staying ahead in the digital revolution.

As the retail industry continues to transform, harnessing the power of VR, AR, and 3D in digital product creation is not just an option; it's a necessity for success in the 21st century.



AFTER THE GOLDRUSH, IT'S TIME FOR FASHION TO ENRICH ITS DPC STRATEGIES

FASHION HAS TILTED HEAVILY TOWARDS A DIGITAL-NATIVE FUTURE, WITH BIG INVESTMENTS IN 3D AND DPC WORKFLOWS THAT WERE PROMPTED OR ACCELERATED BY HISTORIC DISRUPTION. NOW THAT THE DUST HAS SETTLED, HOW ARE THOSE STRATEGIES STANDING UP TO THE SCRUTINY OF ROI ANALYSIS? AND WHERE DOES THE INDUSTRY GO FROM HERE?



Image provided by Lalaland.ai



AASIA D'VAZ STERLING
LONDON COLLEGE OF FASHION

Aasia has a Masters in Fashion Entrepreneurship and Innovation, a degree in Fashion Design Technology, and has previously worked as an Associate Lecturer and Enterprise Consultant - all at London College of Fashion. She now works as a Partnerships Manager at Central Saint Martins and is also an alumna of the University of Cambridge Innovators For Sustainable Fashion accelerator.

Increasingly sustainable supply chains, reduced sampling costs, accelerated speed to market, optimised sales funnels – the list of digital product creation's benefits goes on. There aren't many technology segments that can promise - let alone provably deliver - in all those different areas. And against a backdrop of slowing sales and competitive global markets, these are compelling propositions that an evolving ecosystem of tools promises to provide brands, designers, and creators across a wide spectrum of different job roles.

Take a quick scan of the current DPC ecosystem - these tools are becoming more advanced and nuanced. From upstream to downstream, there is an option for every stage of the product development process. And as The Interline found in its first baseline analysis of the size and scope of the DPC market, this is a significant technology segment in its own right - the equal of long-established enterprise markets.

However, with such a growing and saturated number of solutions available, deciding which ones to adopt is a challenge within itself - especially when a brand's purpose for interacting with these tools is still being determined. Because while there's been a huge and rapid rush towards 3D and DPC strategies, many organisations are now finding themselves in a post-honeymoon period, with a need to better understand and quantify the driving purpose (and the desired results) of their sudden moves into digital product creation.

When the world shifted online in 2020, and digital workflows quickly transitioned from nice-to-have to must-have processes, brands hastily built and implemented rudimental DPC strategies as a blanket solution that could allow them to operate a business-as-usual approach to product development - and who could blame them? At that moment, 3D offered a way out, and a lifeline. So, at that time, laggard adoption of emerging technology was the most precarious situation a brand could find itself in. Being behind the maturity curve, in terms of 3D and DPC, meant missing the capabilities to continue to do business.

Today, the most precarious situation is arguably a different one. Now it's the avoidance of viewing technology realistically, strategically, and empathetically that can quickly upend a brand's market positioning. Or, in other words, rescue has given way to realism, and crisis to cost analysis.

Over the past three years, the fashion industry's understanding of "fashion technology" has evolved significantly. While there's a deeper appreciation for the value of digital tools across the board, brands, retailers, and suppliers have rightly become more critical of the value that those tools can provide in the immediate term.

Take the downstream possibilities of DPC as an example. While there are select brands (several of which are featured in this report) who have pioneered incredibly photorealistic, consumer-facing renders of their digital garments, how many other businesses are speaking to their markets through these assets in ways that genuinely resonate?

And in the opposite direction, how many brands are really making use of their digital assets for the full spectrum of in-house and upstream decision-making to ensure that they're creating the products and experiences their target demographics want?

Now, with the initial sprint towards 3D and DPC over, it's time for brands to ask the following two questions: How can our digital assets serve our market effectively? And what are the tools that are really going to get us there?



Image provided by Lalaland.ai

Enriching Digital Products

When fashion finds itself in a volatile environment, returning to customer-centricity is often the first recommendation from any consultant, strategist or advisor tasked with assessing the current market and posing actionable solutions. After all, the business of a brand is to make and sell things people want - and to make enough margin to keep doing it.

So, when it comes to DPC, teams should deploy both 3D / DPC tools and the assets they create in a way that works vertically across the business, and that enhances different environments for diverse purposes through sales, marketing, production, and merchandising. The return on investment in those tools and those assets will then be realised in a more multifaceted way.

Michael Musandu, the CEO and Founder of Lalaland (which works to place 3D garment designs on photoreal AI-generated models) describes this process as "enriching 3D assets" - a useful term that captures the key function of a whole group of new solutions and workflows dedicated to connecting the DPC process more seamlessly with target markets.

Lalaland, for example, generates its realistic and physically diverse avatars using AI to help product development teams enhance and display assets more favourably, achieving both internal buy-in and external purchases before sampling, production, and sales are even considered. A prime example of how an investment in creating digital representations of products can be returned outside the core disciplines of design and development.

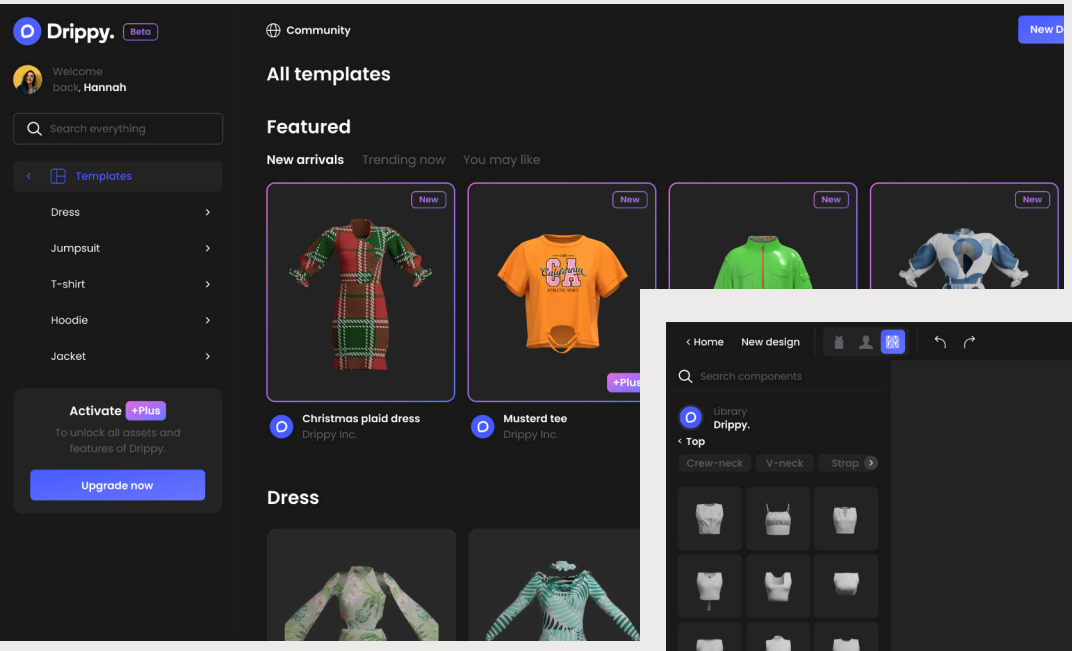
According to Musandu, Lalaland's offer starts at the beginning of the value chain, and the benefits can be woven throughout. As the production process moves away from being linear, tools that mobilise assets back and forth between customers, buyers, and internal teams will become increasingly effective at keeping costs down, informing design decisions and providing insights for production, merchandise, and marketing strategies.

And there are many other examples of tools within this wider ecosystem that draw from different technologies to foster these same connections.

Consider more nascent technology like AR and VR - in Snapchat and Ipsos's Augmentality Shift report of 2022, 6/10 consumers recognised shopping as their main reason for using AR, while 91% of brands think it's primarily used for fun, highlighting the juxtaposing views of consumer intentions and brand assumptions. Start-ups such as OuttaWRLD have identified this gap as an opportunity they can bridge by helping brands create AR experiences that are product and market-specific, and that can employ the digital assets that brands have already built for their own in-house purposes - with the right tools for asset management, preparation, rendering and so on.

Also using virtual try-on, Modern Mirror's Avante-Garde Fitting System allows designers to implement alterations, customisations, and personalisations specific to individual customers using 3D designs. That company was featured in The Interline's first DPC Report in 2022.

Then there's PlatformE, whose B2B Custom service enables personalisation at the point of sale through digital assets, and who The Interline have collaborated with several times this year.



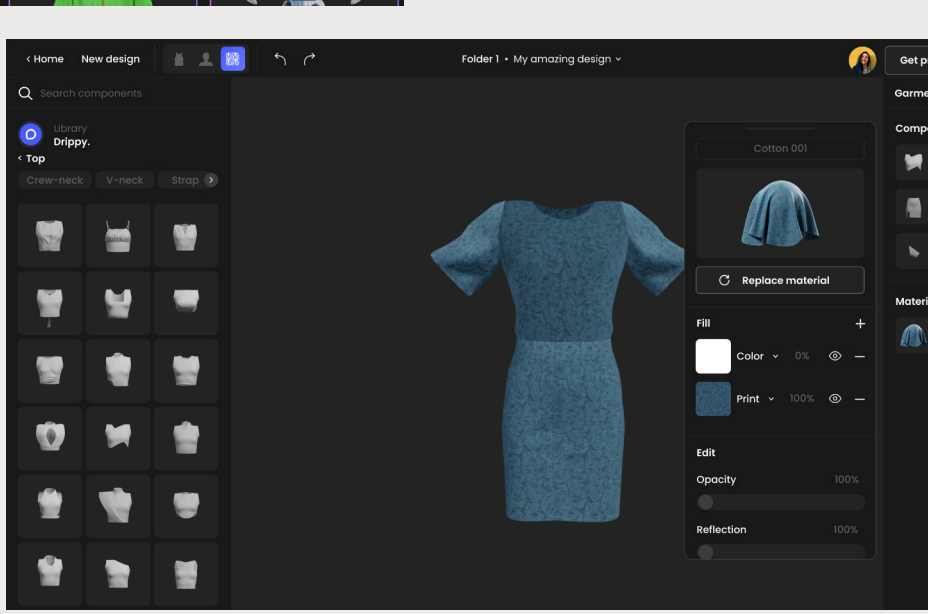


Image provided by Drippy.



Daisy accessories created by Studio LME, SWOP.



Future bag created by Studio LME, SWOP.

These examples breathe additional life into digital products, create engaging experiences, and allow customers to see their physical selves reflected in these rendered garments, bringing value to consumers. And they all have their roots in the same corner of 3D and DPC that brands rushed to occupy when their entire business models seemed to be under threat.

From Digital Fashion To Digital Product Creation

Achieving internal buy-in from decision-makers to invest in market-activating solutions may, at first, take time. The burst of the metaverse bubble and the resulting volatility in the digital fashion space have caused trepidation around the ROI when using consumer-facing applications for digital products. For better and worse, those two trends have become conflated, and as The Interline wrote this summer, the fallout from the tempered expectations around digital fashion then spread to digital product creation as a whole.

However, an argument can be made for digital fashion's ability to, first and foremost, immerse consumers in brand and product stories, and to democratise access to fashion - both of which, again, are possibilities that begin life in the same space and the same solutions where digital design and development happens.

And although primarily untethered to the physical world, some essential lessons are emerging in the sphere of digital fashion. Recent research presented in Roblox's 2023 Digital Expression, Fashion & Beauty Trends report uncovered the influence of digital fashion on their IRL consumption habits. The study found that 43% of Gen Z respondents want to see brands increasingly provide options to twin the items they wear on their physical and digital selves.

"We see this as a natural progression." Lisa Bagge, the Co-Founder of SWOP explains when I ask about DPC. As a digital-first AI platform allowing users to generate new designs via editorial-quality imagery, SWOP sees the eventual value that physical production can bring to their business model, working backwards to transform community-created and emotionally resonant digital fashion into products to be marketed and sold - a process that's highly likely to involve 3D design and simulation as the stepping stone.

Putting Faith In Digital Twins

There are, however, challenges to this approach. "Uncanny Valley" - another phrase Masandu uses - describes a key hurdle to customer acceptance of digital assets, and their willingness to place trust in digital virtual models. When the end goal is to convince customers to buy a physical product, a lack of realism (or a looming sense that the



PuffPuff created by XYZ Studio, SWOP.



Puffee created by Mast Studio, SWOP.

digital and the physical are not close enough to one another) can be a significant problem in acquiring trust towards these digital representations.

"[Sometimes] designers forget the feasibility of the 3D design and create 3D renderings that do not accurately represent the real-life characteristics of the garments." acknowledges Tan Nguyen, the CEO and Founder of Drippy.

This disconnect is a problem that was noted early on when, DPC started to be heavily implemented across the industry, and a lot of work has subsequently been done on the refinement of digital twins to improve their fabrication, rendering, and movement.

But as brands seek to work more flexibly and collaboratively, product creation teams must have the confidence to generate and communicate ideas with customers freely whilst embedding the practicalities of garment construction into their designs - this is a gulf that cannot be allowed to widen. This is what could make Drippy an exciting proposition. As a platform that aims to make DPC equitable by allowing anyone to easily adopt 3D design regardless of their experience through "customisable templates and free materials, " this "LEGO for fashion design" solution aims to enable users to rapidly communicate design ideas at any skill level - shortening the distance between vision and visualisation.



Image provided by Lalaland.ai

Delivering On Customer-Centricity

These solutions built to enhance and extend the value of 3D assets could potentially go a long way towards putting customers at the heart of fashion's DPC output. Each of the founders I spoke with for this article counts diversity and accessibility as key benefits to their solutions, by removing entry barriers to digitally designing products or picturing themselves in them.

Speaking to Musandu about the consumer value of their lifelike AI avatars, he explains, "…if you show more representation… let's say more skin complexions, more body sizes and more age categories, you are now representing more of your markets, which means that you can actually support the purchase decision". Another key strategic objective where digital product creation can return significant value in an indirect way.

On the other hand, Drippy and SWOP (both startups in the Beyond Form portfolio) see immense value in co-creating with their users. "Brands and designers…can then see them as collaborators or partners rather than just customers," explains Bagge. "Imagine if you can say I designed the shirt I am wearing with [a brand like] Hugo Boss."

These examples touch upon the importance of where "enriching" solutions sit within the wider DPC ecosystem, actually welcoming end customers into the process in a way that's only possible through digital tools. By amplifying the reach of 3D products, these technologies can open new dialogues with consumers that help align not just products but entire brands with their market.

The Value Of Market Feedback Loops

"Now, the question is not "should we" BUT "how to" incorporate customers into the product creation process and what incentives can be offered." states Nguyen - and I couldn't agree more.

So, how do brands fold customers into the DPC process? What does it mean, in practice, to align DPC strategies with the common business objective of serving the market the best way possible?

According to everyone I interviewed for this story - as well as experience from across The Interline's team - it will require the creation of robust feedback loops that guide internal teams to build, measure, and learn from market interactions with their digital assets.

By developing 3D designs, positioning them in the market, and learning from performance, brands can begin to validate their ideas and iteratively refine products, eventually moving away from staggered upstream design and development workflows.

And it's essential to emphasise where this is already happening. Lalaland, for example, can help brands acquire market insights through their avatars. Visualising e-commerce customers can help track a particular interest in specific products more geographically and granularly.

Then, there's also the opportunity to build feedback loops that inform on-demand models. Bagge tells me a core goal for SWOP is "aligning production more closely with consumer preferences and reducing the environmental impact associated with excess inventory."

Ultimately, feedback loops should spur brands to actively begin designing for, alongside, and in response to their customers by providing insights at multiple points of their interaction with 3D designs.

Personalised Workflows

In 2023, not only have DPC tools matured, but they also increasingly work together in tandem = as evidenced by the partnerships you'll see by browsing the technology vendor section of this report. These solutions that provide additional market purpose to digital assets have strategically focused on making themselves as easy as possible to integrate into existing workflows - taking the form of plug-ins and cloud-based platforms.

Nguyen, however, makes an excellent argument about the state of Fashion DPC workflows in comparison to other creative sectors. "We already have Figma for UI/UX design, Canva for graphic design, and Webflow/Framer for website development….However, it is interesting to note that the fashion industry has yet to see a similar platform that caters specifically to its needs."

The dream, then, might be a centralised platform with a collaborative interface and an asset library that could help internal teams and end users speak the same aesthetic languages, at the same time as allowing brands to tailor 3D designs for different upstream and outputs, garner insights, and interact with consumers.

But this is just one piece of the puzzle; implementation requires a holistic overview of the bigger picture and a clear intention for the DPC process brands are trying to create. Adopting technology for technology's sake will not deliver the desired results. Instead, internal teams must continue to personalise their workflows and adopt solutions that match the needs of their organisations and their markets. It does no one any good to work at either end of the spectrum, as siloed or chaotic teams.

When we look forward to an era of 3D working and digital product creation that moves on from the initial rush and into the true scale and multi-pronged ROI, openness to iterative and collaborative design will need to be encouraged across the fashion industry. The next year may look bleak from an economic perspective, and it may seem daunting to take risks and experiment with new approaches, but for many brands, 3D designs will exist regardless because they have become so foundationally important to the way those brands operate. And luckily, there is now a rich tapestry of tools out there, ready to help brands, designers, and creators use these assets in dynamic and market-driven ways, and to realise additional value from them that goes far beyond the narrow purpose of virtual sampling.



Show time #2 by Mast Studio, SWOP.



WHY DIGITAL PRODUCT CREATION COULD HOLD THE KEYS TO UNLOCKING DOMESTIC PRODUCTION

THE KEY BENEFITS OF 3D AND DPC TOOLS AND WORKFLOWS ARE EASY TO SPOT IN DESIGN, DEVELOPMENT, AND THE WIDE-OPEN POSSIBILITY SPACE DOWNSTREAM. BUT BEHIND THE SCENES, THEY'RE ALSO PROVING FUNDAMENTAL TO DELIVERING ON THE VISION FOR DOMESTIC SUPPLY CHAINS, AS ONE PIONEERING SOCIAL ENTERPRISE DISCOVERED.

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BY JENNIFER HOLLOWAY
CEO, FASHION-ENTER

Jenny Holloway has been working in the fashion industry for over thirty years mostly in the private sector. Initially she was a buyer for Littlewoods, M&S and Principles for Women before opening her own label Retro. For almost ten years Jenny was Director of her successful business Retro UK Ltd which included retail boutiques, party plan, wholesaling to major retailers such as John Lewis, Principles and independents.

Having worked in the fashion industry for over 35 years I have seen some dramatic changes to the way the industry operates, and what it prioritises. But the last 12-18 months in particular have been the most transformational in the fashion and garment manufacturing space, because they have prompted a complete re-evaluation of many different aspects of fashion all at once.

First, it's important to understand the vantage point I've had on both the long-term transformation of the industry and this new, sudden shift.

As the CEO of the UK social enterprise Fashion Enter Ltd, I saw (and was part of) the garment-making heydays of the so-called "Fast Fashion" era, where our production teams were making up to 30,000 garments a week. In retrospect this was obviously bad news for the planet, and the fact that this model of manufacturing is behind us - at least domestically - is progress. But the alternative side of the story is less positive: for the garment manufacturing sector, the shortfall in demand has made it hard to keep the machines running, the bobbins filled, and people employed.

There are a whole host of conflicting statistics with regard to fashion's status as potentially the second most pollutive industry on the planet, but there are some figures that we can rely on. The UK Fashion Industry is worth £5.78 billion ($7.25 billion USD) (according to Statista) and is set to grow to £10.8 billion ($13.7 billion USD) by 2026. These seem like encouraging numbers until you start to unpick what happens to the value generated:a £30 purchase in the UK leads to an average cost of £20 return for the brand (NRF, Roland Bergeer) of which 27% is landfill - a total estimated value of £140 million that gets thrown away every year

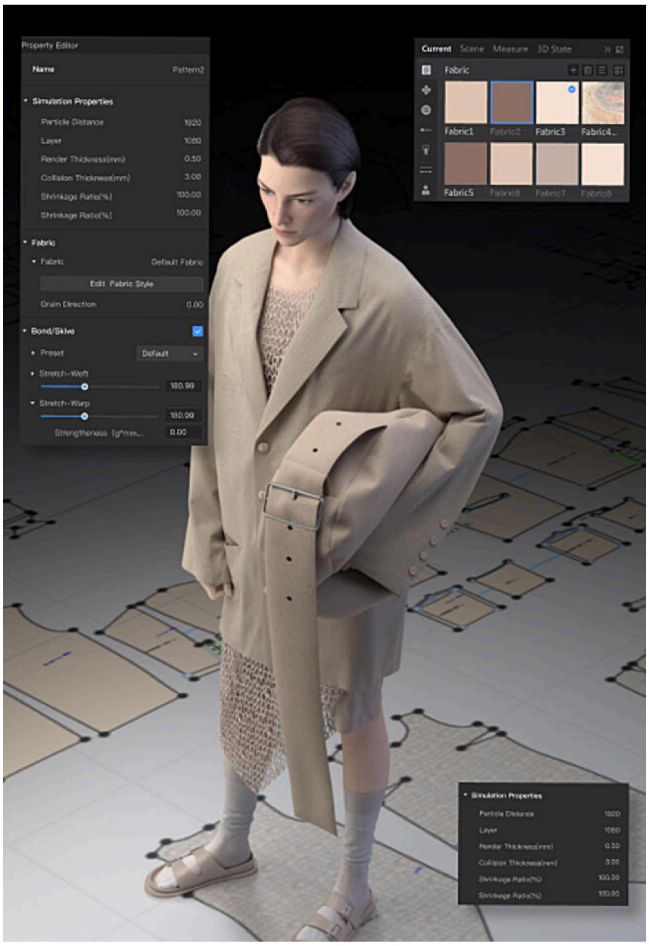
But what do these growth and waste statistics have to do with the downturn in demand for domestic production? And what does this all have to do with 3D and digital product creation?

One of the most wasteful areas I have seen during my 35 year career is sampling! It honestly drives me mad. But there's much more to it than just personal opinion: fashion has a clear sampling problem - one that has a huge impact on speed, sustainability, cost, and overall efficiency. And one that the industry has largely abstracted away by shifting to an offshore, high-volume production model, trading carbon footprint for low-cost, mass-scale iteration.

In fact, this sampling culture has, I believe, been one of the foremost contributors to the decline of onshore manufacturing. By moving the process out of sight and out of mind, brands have grown accustomed to requesting multiple sample rounds and scarcely thinking about the cost… or the waste. But when sampling takes place closer to home, and the scale and cost (an average of £300 per sample, in our experience) become more obvious, the delays, the waste, and the inefficiencies of even great-quality samples produced from beautiful fabrics start to become overwhelming.

But as almost every brand now realises, sweeping the sampling problem under the carpet by pushing it offshore is not a long-term solution. Today, most brands and designers are facing the need to radically improve their speed to market, and to drastically improve the sustainability of their operations. And this is where attention is turning, again, to domestic manufacturing - whether that's here in the UK, in the US, in Europe, or in any local market where clothing is sold.

This is where digital product creation and digital assets can make a tremendous difference and enable brands to capitalise on the craft, expertise, and proximity of domestic manufacturing, at the same time as drastically reducing the time, waste, and cost penalties associated with excessive sampling.



Style3D Studio.



Image provided by Fashion Enter

And we know that from first-hand experience, because the team at Fashion-Enter has spent this year really figuring out how to blend technology and tradition across our Fashion Studio and our main factory. We have been using a host of different software and hardware to improve the accuracy of our internal fit, and we have built two different teams of pattern cutters: some that use technology in a major way, and others - our highly talented and much-respected traditional pattern cutters - that create by hand.

Based on our experience, there's going to remain a demand for both skillsets, whether they exist separately or in hybrid teams. This is something we've learnt based on our internal experiments, and it's also something that our clients have requested - dictated by their own technology maturity, and by their own preferences.

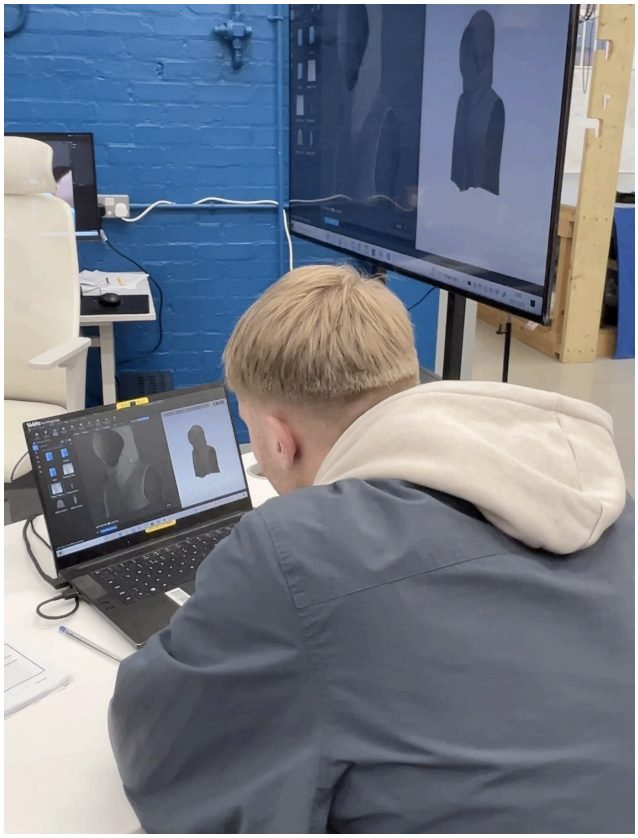


Image provided by Fashion Enter

To really prove both the viability of in-country manufacturing and the importance of technology (especially 3D and DPC tools) in delivering it, our North Star in this testing has been a drive towards lean manufacturing throughout the company. This means we've been looking at the entire life of the garment, and prioritising ways to extend that life into repairs - which is why we have recently opened a new collaboration with United Repair Centre and Patagonia.

But as you can imagine, the most important part of that lifecycle for speed, sustainability, cost, quality, and creativity reasons is the process of turning designs into prototypes, samples, and finished goods with as few compromises as possible.

So, to optimise those critical lifecycle stages, we ended up creating something of a manifesto for the capabilities we, as a full-service domestic partner, needed to have. And we then mapped these different asks to different tranches of technology:

- We needed to be as responsive as possible to buyers that needed new ideas daily, without sacrificing our own creativity.
- We wanted to reduce the downtime involved in sampling from three weeks to just a few days.
- We needed the ability to have samples signed off by the buyer virtually, before material was ordered and patternmaking began.
- We wanted to standardise our blocks for each client; it was prohibitive to bring in different fit models for different buyers, and the cost of buying 10+ new mannequins was also high. We needed a way to use standardised avatars that were realistic-looking, accurate and flexible enough for sizing, and affordable.

- We needed digital fabrics that behaved with absolute accuracy in terms of draping and other properties, so that we could build trust in virtual samples amongst our own teams and our clients.
- We had to establish a way to then drive sustainable, make-to-order production, bringing together software and hardware that can automate the lay planning process to get the best possible material yield.

On top of all that, we also needed to retain our ethical status, our reputation as being an honest broker, and we as been gigantic.

If this sounds like a tall order - it is! But it's also, from an industry perspective, essential. And not just for a domestic partner; every vendor that you, as a brand, work with is facing the same challenges and the same demands, and as we worked through this process it became clearer than ever to me that there's no way for fashion to deliver on its targets without the help of technology.

Critically, that's also a scary thing to admit. During this whole process, I encountered an emotion that I expect a lot of other industry veterans have felt recently: that this is all new and alien, and that perhaps their skills and experience are a bit redundant in this new digital age.

But it's important not to let that feeling paralyse us, which is why I made the bold decision to take that manifesto and use it - with the help of some key technology partners - to create a new Fashion Technology centre in Unit 4 of Fashion-Enter, which would bring together all the waste-reducing, time-optimising, creativity-empowering technologies we could find to create a state-of-the-art microfactory that could become the home to our unique production methodology.

And that microfactory has since become a showcase for just how transformative an end-to-end digital workflow - one that heavily incorporates digital product creation - can be.

We started with the hardware, partnering with Kornit Digital at the time of the launch of their Presto Max and Atlas printers, which unlocked digital printing onto both fabric and finished garments - digital artwork and digital colour references, delivered digitally, eliminating all of the analogue iteration and uncertainty that contributed so much to waste and lost time in the past.

This wasn't always a straightforward swap of traditional machinery for new. We had lots of locational issues, such as the machines being so big we had to obtain planning permission (utterly painful) and knock down internal walls, but we did it and that technology has been truly transformative. As well as creating a new, digital-native, endpoint, this partnership has also changed the service we can provide: instead of minimum print runs of 500 metres, we can now print in just single-metre lengths, delivering real make-to-demand and opening the door to what we refer to as "one piece flow".

Next came Zund, which connected to Kornit, and which fully illustrates the power of single ply cutting.Our teams can now upload a range of orders, all into the system, and then have Zund cut out the individual garments into the unique sizes. Fabrications have to stay the same for each order and someone has to physically be there, attending the machine, to gather up the individual cut garments but what a dream that is! Anyone who runs a factory or sampling centre knows how expensive it is to cut out single samples - and I've already talked about just how damaging large-scale sampling can be for fashion's overall workflows

Next came Style 3D, who I know are also featured in this report, and it quickly became obvious just how important digital product creation tools would be for realising our ambition. Everyone at Fashion-Enter had high expectations for the difference it would make to shift 2D workflows to 3D, but even those expectations have been surpassed. The difference 3D has made to time, creativity, and even the creation of new opportunities has been gigantic.



Images provided by Fashion Enter





Image provided by Fashion Enter

As someone who worried, during this process, that technology would replace traditional skills and workflows, I'm happy to be able to report that the opposite is true - we've found that 3D has enhanced basically every aspect of our work, and revolutionised the way we engage with our clients. Here are just a few highlights that showcase how instrumental our work with Style3D has been to creating a lean, digital workflow without undermining any of the elements that make us unique:

- Zero waste design and ease of garment manipulation.
- The availability of more than 50,000 digital assets as a foundation for experimentation and creativity.
- The ability for our teams to use AI to generate new design ideas from uploaded photographs.
- The accuracy of fabric digitisation, so that virtual materials reflect not just the aesthetic characteristics but the real DNA of the fabric.
- Soft body, poseable avatars that are accurate enough for lingerie and swimwear design, where tolerances are incredibly low, and adaptable enough to tailor a base avatar for each client and even each individual customer. And these same technical avatars are also usable as virtual models, with facial expressions, believable skin tones and surfaces, hair, and eyes.
- The ease with which we can export patterns from design and visualisation and into production. Whether we're exporting as a PDF or a DXF, the process is seamless - excuse the pun!

Then the final stage for us has been our unique collaboration with the United Repair Centre and Patagonia, as seen on screen this winter! We had Sky News review our set up, contrasting the old way of production in our Unit 14 with the new way in Unit 4. Now having repairs on site means that we can truly be sustainable and extend the life of a garment exponentially - really quantifying the impact that a DPC-enabled and all-digital production process can have on over-consumption.

So, welcome to the new age of fashion - in brief. Despite the huge advances that have been made in technology, it's been a hard, bumpy road to get here, and one that I think as a relatively small, social enterprise has been a brave path to go down. But it's pretty unambiguously a path we couldn't have walked without the support of technology, and 3D / DPC tools in particular.

The one brick that hasn't fallen into place, though, is the attitude of the UK's big brands and retailers to proximity sourcing. So much of the negative impact of sampling and production overseas can be solved by working closely with a partner that has really proven the ability of DPC and other digital tools to deliver an in-country offer that deserves a key place in their sourcing strategies. Perhaps 2024 will be the year that the wider industry wakes up to the opportunity - and with the support of our technology partners, Fashion-Enter will be waiting.



Image provided by Style3D

Editor's note: To find out more about Style3D, turn to the technology vendor section of this report.

REAL-TIME 3D : THE NEW FRONTIER IN FASHION AND LUXURY

TODAY'S IMMERSIVE, REAL-TIME EXPERIENCES ARE THE NEXT LOGICAL STEP IN A DESIRE TO BRING AUDIENCES INTO STORIES AND IDEAS. WHAT CAN HISTORY TEACH US ABOUT THE RIGHT WAY TO APPROACH THAT AMBITION? AND WHAT POSSIBILITIES DOES THE NEW GENERATION OF TOOLS AND ENGINES UNLOCK?





BY SAFIR BELLALI
TECHNOLOGY EVANGELIST & FOUNDER OF ALIPH DIGITAL

A passionate creative who sits at the intersection of design, technology and education, Safir Bellali's 25-year experience leading design and digital innovation initiatives spans across multiple brands and industries. This experience has strengthened his understanding of the imperative of continuous learning, the power of collaboration and the responsibility we hold as innovators to take on today's societal and humanitarian challenges through our collective creativity. He is an Aspen Institute First Movers fellow, chairs the 3D Retail Coalition's Education Committee, consults for creative technology companies (full disclaimer: Epic Games is one of them), and teaches Design and Innovation at Art Center College of Design. He's also leading an effort to create an educational program in Design and Digital Creation in Morocco, to serve the African continent.

As I was preparing to write this article, I found myself having to explain to my twin 10 year-old daughters what immersive experiences actually are - which is a question I'm sure readers of this report have also wrestled with. The best analogy I could come up with was that of playing pretend in a world that feels like you're in a dream. Sometimes your dreams are vivid and realistic, sometimes they can be fantastical and surreal, but you are very much in the middle of them, exploring, doing things and interacting with the elements of the world you're in.

And as long as there have been stories and artworks, people have shared a desire to bring people inside them - to allow readers, watchers, viewers, and listeners to live their creations in that same dreamlike way. This desire to create and share immersive experiences with others is as old as it gets: 17,000 years ago, a Paleolithic tribe in Lascaux, in southern France, painted huge animals (bulls, horses, felines, stags) on the caves' sandstone walls and animated them through the flickering of their fireplaces. What we know today as static artworks were, at the time, the most immersive way of imparting themes and stories and ideas.

Another example of what is in fact just a different way of storytelling were the Medieval mystery plays, which were performed in multiple adjacent 'stations', between which the standing audience could wander at their leisure, thus maintaining full autonomy over their experience, and turning observers into agents. Fast forward to the now world-famous MSG Sphere in Las Vegas, where this concept is taken to the extreme, with audiences able to be immersed in a dome of content as varied as a concert (U2 was the opening act there when it launched in September), an immersive wildlife documentary, or a Formula One viewing party.

The road from cave art to LED dome was a long one, but the thread unifying all the steps along that journey is a clear and simple one. And at every juncture, the same conclusion has been reached: entertainment, art, music, work - everything is enhanced when people are welcomed inside it and empowered to really *experience* authorial and artistic intent.

But what does all this mean in the world of Fashion and Luxury ?



Louis Vuitton.

Before we start, we have to recognize that our wider society is undergoing a massive digital disruption, which has dramatically changed the way we communicate, work, shop, and live our daily lives - and fashion is one part of that far-ranging transformation. All-in-all, today's consumer is more connected, better informed, more discerning and overall more eager to engage in new types of experiences because wider distribution of technology has made those experiences more accessible, more inclusive, and more readily available. Not *universally* available, but certainly a long way from having to physically travel to a cave or an open-air theatre to experience something new.

But with the speed of technology evolution, the expectations of the next generation of shoppers are changing too. Now we have seen, over the past couple of years, the incredible rise and dramatic fall of public interest in Web3 and Metaverse initiatives, and that's coloured the way people think about what it means to "step into" an experience - mostly for the worse. But while this points to the fact that this global infatuation was built on shaky foundations and technologies that still needed plenty of time to mature, it doesn't mean that our generation of consumers is not hungry for powerful experiences that are digital and immersive in nature. They just need to be designed properly, and built on the realistic, proven, foundations that already power wildly successful real-time experiences in other sectors.

And if we look at recent data, the numbers certainly point in the direction of ongoing demand for immersive experiences even after the Metaverse fallout has settled.

A 2023 study from Salesforce found that 80% of the customers they interviewed say the experience a company provides is as important as its products and services. This is a major development, because it is not enough for brands to just create great products anymore, they now have to think about creating whole ecosystems around their product offering.

Kristin Maa, senior vice president of growth at Saks Fifth Avenue said in a recent interview: "The future of luxury engagement is going to be about customisation that is dictated by the consumer, meaning a customer being able to express themselves, give feedback and have more control and input in the way they experience brands, rather than brands pushing a narrative onto them."

Luxe Digital, too, found that Affluent Millennials and Generation Z consumers are driving 85% of the global luxury sales growth -now representing over 30% of all luxury spending. And what's becoming clear is that these younger, affluent shoppers have different expectations when it comes to retailing. They want an experience that is personalized and seamlessly integrated both online and offline, physical and digital. According to a 2023 BCG x HighSnobiety report, they want "Stories over product; knowledge over possession; community over crowds; participation and experiences over observation." And if you think that sounds familiar to our long, species-wide history of wanting to step inside stories and sensory experiences, well, you're not alone.

A 2021 Bain & Co report predicted that Online will become the single biggest channel for personal luxury goods in the coming years, making up 28%–30% of the global market in 2025. And, according to Salesforce again, 74% of customers expect to be able



Vivatech / LVMH

to do anything online that they can do in-person or by phone. And most tellingly, according to HighSnobiety and BCG, the #1 reason for the New Luxury consumer to follow a brand is to 'live in the universe they have created.'

Finally, the team at The Interline have observed, several times over the last few years, that both the fashion and gaming sectors have started to recognise the potential to reach new audiences by tapping into each other's customer bases. According to those articles and a range of other industry sources, it's widely predicted that both fashion and gaming solution platforms will eventually offer integrated ecosystems that share common assets and file formats, which will enable designers from both worlds to coexist and share digital assets seamlessly. And, if anything, the consumer demand is already far ahead in that regard.

Which brings us to the announcement, this past June, that LVMH and Epic Games signed a strategic partnership to transform the historic group's creative pipelines and customer journeys through the use of the technology giant's ubiquitous Unreal Engine and associated tools.


Epic Games / Unreal Engine.



Balenciaga x Fortnite

Toni Belloni, LVMH Group Managing Director said in a statement: "The partnership with Epic Games will accelerate our expertise in 3D tools and ecosystems, from the creation of new collections to ad campaigns and to our Maisons' websites," he added."We will also engage more effectively with young generations who are very much at ease with these codes and uses." This commitment signals a major shift in how luxury brands view 3D digital technology - now an integral part of their end-to-end go to market strategy, and a signal of just how much emphasis these organisations place on digital assets and experiences..

But let's take a step back and talk about the tech... I assume that the majority of the audience for this report knows exactly what real-time technology is, but in the spirit of inclusivity, let's clarify this term:

3D visualisation refers to the process of representing 3D content on your device. Over recent years 3D visualisation has gained great popularity, and evolved into one of the most essential methods of producing high-quality, photorealistic content. Numerous industries - ranging from films, games, engineering, architecture and manufacturing - are taking advantage of that technology to bring ideas to life. And 3D visualisation technology has come a long way since the days of MIT's Whirlwind computer in 1951. Better hardware performance and better rendering engine technology (a lot of which comes from the videogame sector) have, over the years, led to an incredible improvement in visual quality for 3D objects, scenes, and characters that are rendered in real-time.

And there's also a crucial distinction to be made between real-time rendering, which means that visual frames are being in generated on-device for instant viewing (at target refresh rates from 24 to 120 hertz) as opposed to offline rendering, which refers to more accurate, time-consuming calculations that create frames over the course of minutes, hours, or days depending on complexity, and those frames are then compiled and played back to create motion. For a simpler distinction, think the difference between a videogame and a CG movie.

(There is also a growing movement towards cloud-based real-time rendering, where high-spec computers in datacentres do the local, real-time frame creation and send their output as video streams to lower-powered consumer devices, which relay the user's inputs. This is a way to achieve top-flight real-time graphics on handheld devices and other clients.)

With technologies like Epic Games' Unreal Engine 5 and the other tools in the UE ecosystem, you can interact with 3D images or scenes (as you would in video games) that appear to be moving in real time, with a degree of realism never seen before. Real-time 3D streamlines everything by placing the user in the virtual environment and letting them navigate it - just like in your dream - as opposed to presenting them with content that has been pre-rendered or pre-animated.

For fashion's purposes, you can now simulate the behavior of a person and the garments they are wearing in real time, as opposed to having to wait for an animation to be completed and played back.

So how successfully have fashion and luxury brands engaged with this technology ?

We all remember when, in late 2020, Balenciaga, one of the pioneers in this space, showcased the company's FA'21 collection by publishing a video game, Afterworld. They also scanned their outfits and made them available in embedded iFrames powered by Sketchfab, another web-based real-time visualisation platform that helps bring real-time 3D content to the masses. You were able to examine, in your browser, the outfits from any angle and zoom in on details, which you couldn't always do with traditional product photography.

A year later, Balenciaga partnered with Epic Games' Fortnite, one of the most popular game franchises out there, to launch a capsule collection that bridged the gap between physical (items like hoodies, t-shirts and hats were available for purchase) and digital (Balenciaga skins, emotes and accessories were available for purchase in-game). This launch was nicely capped with an incredible OoH (out-of-home) activation - a 3D anamorphic billboard that captivated crowds in London, New York, Tokyo and Seoul.

Gucci has been among the most active fashion brands exploring the worlds of gaming and Web3. According to a December 2021 statement by Gucci, a "'Digital First' imperative and 'test and learn' approach" are key to the

brand's business strategy. At the end of 2022, they launched the Gucci Vault on the real-time web platform the Sandbox, making it the first major luxury brand to build its own world on the metaverse platform. This heavily stylized and playful activation was meant to appeal to a younger demographic of gamers who would then build an affinity with the brand.

Just a few months ago, in Milan, newly appointed Creative Director Sabato De Sarno unveiled Gucci Ancora, his first fashion show for the House. Users can play three mini games to win limited edition goodies within the creative neighborhood of Brera, where art and fashion come together. As a participant, you are invited to be part of the Gucci community and get to experience Milan Fashion Week even if you're on the other side of the planet.

This past June, I was fortunate to be able to attend the VivaTech conference in Paris, where LVMH's booth, called the Dream Box, showcased various inspiring interactive projects from its most active Maisons. This is also where the partnership with Epic Games was announced.

Fendi, to present to the public their omnichannel approach, created a playful experience built for a mixed-reality headset. This experience extended the physical boundaries of the Fendi headquarters in Rome, through the representation of live digital shopping nights and virtual styling tools to AR marketing campaigns.

Louis Vuitton showcased a six-minute interactive and immersive experience they created using Epic Games' Unreal Engine 5 and Z-emotion's Z-weave 3D technology for digital garments. The experience was a beautiful digital recreation of the 2023 men's Fall/Winter fashion show styled by Olivier and Michel Gondry. The whole experience was made available for the public to play and explore with a joystick on custom-built video arcades. Those who missed the in-person fashion show had the opportunity to relive it in an incredibly immersive way.



Sephora / Sephoria



Gucci / The Sandbox

Even Sephora, LVMH's beauty Maison and retailer, understands the power of interactive experiences and launched the Sephoria virtual beauty event during the pandemic. Sephora has a unique, playful, and socially driven approach, and allows attendees to discover the latest trends and exclusive products through hands-on experiences and interactions with many of Sephora's brands, beauty icons, and surprise guests no matter where they live.

Real-time virtual shopping experiences are the holy grail of the fashion and luxury world. If done right, they have the potential of completely redefining the e-commerce shopping experience. One of the key unlocks is the ability to have access to an incredible amount of data - in real time. In 2021, L'Oreal launched an intriguing connected device that prints lipstick for its Yves Saint Laurent line. Customers upload a photo of their outfit to the YSL app, which generates a few colors to match. After using augmented reality to finetune the colors to get exactly the shade they desire, the customer presses a button, and the device prints a few drops of the lipstick. But because this is fundamentally an app, each screen tap, each tweak, and each action by the customer is a touchpoint that yields an incredible amount of insights. L'Oreal captures data on all these interactions and sends the information to product design and development, marketing, sales, allowing them to see what works and what doesn't. The amount of real time data generated is enormous.

Virtual shopping platform Obsess, one of a handful of successful platforms, shared that brands have seen a 109% higher average session time in their virtual store vs traditional e-commerce site. Brands have also experienced up to a 25% higher add to cart rate after visiting a virtual store. Of course, the experience has to be absolutely worth the time spent online, or the customers won't come back.

The challenge for brands is to create a virtual shopping experience that is so compelling that their customers will feel comfortable making purchasing decisions without



seeing, touching, smelling or trying the product on. It's one thing to gamble on a $25 tee-shirt, but when it comes to a luxury item that can cost a whole paycheck, the stakes are different. The shopping experience has to offer a value proposition that is unique and irreplaceable, it has to elicit an emotional response that will transcend the digital gap. It has to bring storytelling to a level such that the audience has to forget about the things they can't do and let themselves be transported in a world that is created just for them. This requires an absolute commitment to visual quality and fidelity that today's tools and pipelines fortunately enable.

But as logical and compelling as they are as extensions of the virtual shopping, gamified brand experiences, and digital storytelling are not the only benefits brought by the adoption of real-time 3D and game engines. There are logical, tangible, and measurable reasons why digital product creation combined with real-time visualisation will bring value to a brand's go-to-market strategy:

A more sustainable and agile product creation process - at scale: All the benefits brought by digitalising the product creation process can only be realised, season after season, across whole collections (if not the whole product offering) through the use of real-time technology, given the sheer volume of data to be processed.

A more personal brand connection with a broader, demanding audience: High quality digital experiences (like virtual try-on) and engaging, context sensitive product presentations allow customer interactions to be tailored to elevated individual expectations.

Innovative and personalised product experiences: Digital assets and platforms, augmented by realistic material simulation, unlock high-value interactions like virtual try-on and product customisation.

Valuable data captured in real time: Throughout the product life cycle, from concept to consumer, valuable data is attached to the product as the digital twin informs product, marketing and sales teams in real time.

More inclusive & global communities: Digital assets unlock experiences that reach broader audiences and allow brands to build communities well beyond the traditional geographical and social confines.

It is therefore becoming increasingly clear that luxury and fashion groups have an incredible opportunity, in the near future and with the right technology choices and thoughtful investments, to create powerful, seamless and inclusive experiences for brands and consumers, to connect in a meaningful way that carries through the long-standing human need to bring people into the stories we tell, and to straight-up redefine the rules that govern the sacred triad of Product, Brand and Audience. But the value proposition of these experiences has to be clear to the discerning customer, and it has to justify the investment. Without clear utility and purpose, they risk ending up on the pile of short-lived, gratuitous experiments that have defined the NFT / Metaverse era.

And speaking of experiments, brands need to start thinking about platforms rather than pilot projects - persistent destinations rather than individual activations - if they want to build meaningful, lasting, real-time relationships with their most discerning followers. The most immersive experiences and the best stories won't be brought to life any other way.



FASHION'S NEXT GENERATION: HOW TECHNOLOGY AND CULTURE ARE COMBINING

TECHNOLOGY HAS BECOME A DRIVING FORCE BEHIND CULTURAL EVOLUTION, AFFECTING NOT JUST THE WAY DESIGNERS AND BRANDS WORK, BUT THE PRODUCTS THEY CREATE. WHAT DOES THE NEXT EVOLUTIONARY STEP FOR FASHION - AND SOCIETY - LOOK LIKE?



BY ANTONIO TALARICO
CO-FOUNDER,
FUTURE FRONT ROW

Antonio is the Co-Founder of Future Front Row, an experience showcase of a digital catwalk show, showcased at Amsterdam Fashion Week '23. He previously was a producer for an immersive mixed media museum called Nxt Museum, and led Partnerships at both MetaMundo - a marketplace for digital assets - and Based - a motion capture studio.

Felix Meritis - The Messyverse - JVDPhotography

We tend to think of the world standing at a crossroads: a digital future in one direction, and a physical past in the other. How many times have we heard "digital transformation" depicted as an inexorable pull forwards? How often do we talk about "analogue" in a negative sense?

For fashion, and for culture as a whole - since the two go hand-in-hand - I think this is a false premise. The future should not be defined by a complete departure from the physical, but by a careful balance between the two strands, and a new narrative that brings together the best of the physical world and the most potent possibilities of the digital one.

In the context of fashion, that means identifying where the industry's deep heritage meets the new digital frontier, and it means being both critical of some of the unfounded promises of "digital fashion," at the same time as recognising that, for a new generation of fashion buyers who are collectively shaping the culture of tomorrow, status symbols are now as likely to be digital as they are physical.

This is also just thinking about fashion as product - as objects to be bought and worn. But the industry also has a huge impact on the wider cultural conversation, and while it's difficult to prove some of the much-praised claims about consumers buying digital garments instead of physical ones (with a possible net sustainability benefit) it's clearer that the digital side of the industry *has* helped to elevate awareness of over-consumption.

But to what extent does the next generation of fashion makers and consumers understand and sympathise with the sector's long physical legacy and deep heritage? Does a cohort raised on the idea of digital fashion run the risk of becoming desensitised to the industry's hard-fought history of craft, marketing, and communications? Or does the future look more positively blended, with digital and physical operating naturally in tandem?

To answer those questions, we have to start by evaluating why - and how - technology became such a potent cultural force to begin with.

The Shift: How Technology Came To Define The Aesthetics Of The Future

Technology, more than any other narrative in the last 30 years, has been the prevailing "spirit of the time". In almost every instance, across every medium and every channel, we have become deeply acquainted with its power to mold, disrupt, shape and percolate through so much of our society. On a daily basis, we all interact with, become inspired or frustrated by, and have our interactions and opinions shaped by technology.

This is why talking about technology is, by definition, talking about society and by proxy, talking about culture. Technology discussions often focus on automation, or the power of technology to improve companies' bottom lines, but in my opinion the real, visceral property of technology is the influence it has on aesthetics. Because that's the business that fashion is in.

There is perhaps no better example of this than the extent to which consumer technology has eaten into the fashion accessory market, with people spending money on smartphones that they would once have spent on accessories. For a huge market segment, devices have become tools for self expression, and the focus of a new kind of fashion that blends digital functionality with aesthetic form.

This is the space that digital fashion is trying to insert itself into: standing on a thin line between fashion and technology, and asking big questions about how far the pendulum might swing in the opposite direction.

Because while it's unlikely that augmented reality try-on is going to make a quantifiable dent in the trend for bulk buys and social media try-on hauls, the idea of digital fashion is still working its way into the public consciousness and starting to challenge some long-established notions of what people value, what they covet, and what constitutes a signifier of status.

Take Apple Airpods and smart watches.For the generation that doesn't remember, or didn't grow up in the wake of the craftsmanship of Valentino, Alexander McQueen and the



Future Front Row - Augmented Viewing



Future Front Row - Suza Voss x Harriet Davey

like, these devices hold the same kind of status as the low-price-point luxury portion of the fashion market - something that luxury will have a real struggle fighting against .

For Gen Z and Gen Alpha, status symbols also come in the form of influencer-driven fashion statements. And it goes without saying that the ostentatious attempt of luxury brands to keep up with this shifting definition of celebrity, has barely made a dent into the new generation's perception of who holds the creative reins - and it's arguable whether that dent is for better or worse.

For the wider population, the excitement of catwalks has now been replaced by big tech new gadget releases, and the accessory market taken by Rayban's partnership with Meta to produce the second-generation smart glasses - not to mention the Humane AI pin - has made brands bend to start offering phone cases and Airpods pouches as an option alongside their more traditional accessories.

What we saw on Coperni's catwalk with Naomi Campbell's walk, wearing the aforementioned AI pin, will become more common, rather than an anomaly. Technology is making significant inroads into what we wear - as well as into the industry's balance sheet: in 2020, Apple's apparel accessories sales were 25% of all luxury brands sales, combined.t's not an overstatement to say that technology is eating through the "status symbol" idea that once was predominantly retained by fashion, and possibly only shared with the automotive and watchmaking industries.

But wearable technology is only part of the picture. While there's no disputing the influence that consumer devices have had on what we wear, and what fashion creates, the next stage of technology's inroads into fashion are likely to come from new identities, new sub-cultures, and new spaces that the digital-first generation inhabits, and therefore embodies, as their own.

Digital Subcultures

In all the above, I'm sure some readers will think these statements are either fictitious or trivial, but only a short sighted eye would be so sure that the role the fashion industry plays in the generations to come will be the same as it has been in the past. And there is no real reason to assume that traditional clothing categories, existing channels, or entrenched mediums will continue as they have in the past decades..

For the next generation, the affinity for legacy brands is already fading. This is a new cohort: a group of people that has far more alternatives, doesn't take kindly to the "top to bottom" approach of being told what to wear, and has been so wired into new avenues and subcultures that the idea of being in the front row of a traditional catwalk holds very little appeal.

These consumers are already influencing the direction of fashion with their spending patterns, but when they become a larger part of the economic class, brands will need a completely different approach to target them - or to at least entice them into thinking that the brand represents them.

The people born post-Y2K bug fear are personifying and manifesting in what resembles, in its very early stage, Baudrillard's "simulation and simulacra". They are not capable of discerning between the real and the representative of the real. For them, the object and its representative symbol are the same. What better object between a handbag or a smartphone, represents the current times? And in that blurry ground between the real and the hyper-real, what role will digital fashion play - either as a representation of physical products, or as its own category?

Technologically driven subcultures like gaming, cosplay, avatar creation, AR filters and many other are, for sure, still self-segregated and cliquish, but they are reaching escape velocity. It's become routine, today, for fashion brands to be surprised by the emergence of cultural moments - and to find themselves scrabbling to produce new styles to respond to those sudden trends.

But this distance between traditional fashion and subcultures and movements is shrinking quickly. Consider how quickly "street culture" went from being frowned upon to setting the tone for the whole of the fashion industry. How long will it be until the same happens for other cultures that, right now, fashion looks down upon until they suddenly overtake the cultural conversation and the industry finds itself on the back foot?

When it comes to gaming, for example, the numbers speak for themselves. What started as a cottage industry created from the passion of a few hobbyist coders now captures 3.09 billion people "", and is drawing the attention and the budgets of some of the biggest brands in the world. All it will take is one top fashion executive (likely someone who



Felix Meritis - The Messyverse - JVDPhotography

grew up with the medium) to recognise that this is where the new generation lives, and suddenly gaming might also start to dominate and lead the cultural conversation.

And this will have much deeper implications for fashion. In theory "dwell time" in interactive entertainment is far superior to any other digital platform, but crucially this sector also represents not just a completely new channel, but a fundamentally different model of fashion, with avatars whose clothing and accessories might matter as much as - if not more than - what their alter-egos wear in the real world.

This transition has slowly started this year, but I expect much more to come. And the tipping point will happen when brands begin to realise that selling digital fashion can be just as viable a business model as selling physical fashion - bringing together two business units and two models as a whole.

Conclusion: The Medium Is The Message

So what can the fashion industry do to capitalize on the upcoming shift in perspective from a generation that has grown up with the digital and physical world intertwined?

The first step, which is one a good amount of brands are already taking, is to be present in the spaces these communities already occupy. The countless gaming activations by fashion brands in Fortnite, Roblox and the likes, are proof that the above is not a new concept or idea, and it is already being taken seriously by certain companies.

The second, and possibly the most important, is understanding how quickly cultural trends, lingo, and especially aesthetics can migrate between the two realms. All this has its roots in common analysis of social media sentiments and trends, but the next stageis an entirely different way of thinking of what fashion represents, stands for, and the role it plays in the wider scheme of culture.

It's also especially vital for brands and designers that are working and creating with 3D and DPC tools today, to understand that small steps taken now can translate into huge strides later on in the positioning of your brand optics, cultural cachet, andmarket stratification. I believe that transition, when it comes, will be both sudden and profound enough to lead to many brands being left behind - just as happened in the eCommerce shift - as well as elevating other brands, which are prepared enough to have digital products and digital workflows, to the top positions.

Last but not least, that there's a real argument to be made for elevating the fashion experience into a hybrid space that falls between traditional craftsmanship, artistry, and the dream-like, dystopian and utopian digital spaces that the next generation occupies.

As a brand, ask yourself what it will mean to be both realistic *and* artificial in a way that reflects the general intellectual, moral, and cultural climate of the current era, without deviating from the core of what your brand represents. The current activations with CGI out-of-home campaigns from Jacquemus and others are lighthouses in this area. AR activations have fast become the new standard. And hologram catwalks, where fully digital fashion enters official Fashion Weeks are another example of how this blending of channels speaks directly to a generation that sees the digital and the physical as equal parts of a whole.

For better or for worse, technology is and will be the predominant cultural movement of our time, and the most pressing question facing brands who are forward-thinking enough to be reading a report about digital product creation is what the role of fashion will be in this brave new world. The market will dispose of the ones that don't find an answer, by the law of demand and supply economics, which will be just as cut-throat in the blended digital / physical future as they are today.



Future Front Row - CodeCouture



Future Front Row - DRESSX-c.gital

HEARTS AND MINDS: HOW DPC IS SLOWLY, BUT SURELY, BECOMING STANDARD PRACTICE - AND WHAT THAT MEANS FOR THE SUPPLY CHAIN

BEYOND THE PROVEN VALUE OF DIGITAL ASSETS AND WORKFLOWS IN-HOUSE, HOW SUCCESSFUL HAS FASHION BEEN AT ACCESSING THE DPC EXPERTISE THAT EXISTS IN THE SUPPLY CHAIN? AND HOW PREPARED IS THE SUPPLIER BASE FOR THE EXTRA WEIGHT OF EXPECTATION THAT'S BEING PLACED ON IT?





BY EMMA FELDNER-BUSZTIN
NEWS & FEATURES EDITOR, THE INTERLINE

Emma Feldner-Busztin writes about how technology is shaping our world and how global trends and patterns will impact the fashion industry. She currently serves as The Interline's News and Features Editor.

Digital Product Creation (DPC) is now an integral part of the fashion landscape, with many brands, retailers and suppliers using DPC-ecosystem tools day-to-day, and some of the biggest names in the industry making gigantic bets on replacing physical sampling with digital. As The Interline explored recently, Kalypso's 2023 DPC survey revealed that "most" product leaders in retail, footwear, and apparel are now engaged in a 3D or DPC strategy - with nearly all major retailers and brands in both the US and EMEA having made some level of investment in DPC. And this research mirrors our own findings from The DPC Report 2022, which demonstrated that 3D and digital product creation are now equal in market scope and size to long-established enterprise technology segments like PLM.

So the business case for DPC - as a connected ecosystem to digitally create, manufacture and sell products - is one that the industry at large has tested and verified in discrete areas, even if it hasn't yet connected all of those areas into a cohesive, end-to-end cycle with a true digital twin at its heart. In those specific lanes, though (design, development, prototyping, sampling, sales, marketing and more) DPC offers proven efficiency, which translates into faster time-to-market, and reduces reliance on physical samples that generate higher costs and create more waste for the environment to try and absorb. A net benefit to speed, creativity, and sustainability is a potent combination.

But elsewhere in the value chain, is the case for DPC as clear-cut?

Much of the conversation around DPC has, so far, been conducted from the perspective of brands and retailers, in some cases drowning out the voice of the suppliers - even as fashion is placing more of the burden of digital asset creation on those partners.. Some of this could just be the nature of how suppliers operate, with information exchange staying within industry circles; the actions of manufacturers and material suppliers rarely make headlines the same way that brands' initiatives do. But if fashion is going to successfully take DPC out of its "design, development, and marketing" box, and extend the value of digital assets into production and real product definition, it's going to be vital for those companies to have an equal seat at the table.

So, in addition to the manufacturer perspective you'll find elsewhere in this report, I spent time with **Alexander Levin, Head of Digital (UK) at Li & Fung** - a company with a rich history, spanning over 100 years, and a name that has become synonymous with the globalised supply chain. To put that into context: the Hong Kong-headquartered multinational group specialises in managing supply chains of high-volume, time-sensitive goods for retailers and brands worldwide, delivering a diverse range of products from a network of over 4,800 suppliers in over 40 production countries. If any company has a broad, blended perspective on the penetration of 3D and DPC workflows into the supply chain, it's likely to be Li & Fung.

Levin recalls seeing steady, incremental progress that suddenly ramped up when the joint tipping point of technology maturity and external disruption was reached in the last few years..

"It's come a long way in the last five years alone," he told me. "Pre-COVID, people in the supply chain were still hesitant about DPC, although they were definitely intrigued by it. A barrier was that many were set in their traditional ways of working."

But as the wider industry also found during the earliest days of the pandemic, a technology class that was once an interesting curio quickly became essential. At that time, being able to create digital assets was not a luxury but a matter of survival; travel was impossible and usual chains of production were disrupted.

"COVID hit, and the supply chain shut down," Levin said. "All sides were clamouring for 3D because they simply couldn't get physical samples." And beyond sampling, the sudden closure of physical showrooms, crucial for certain B2B business models, hastened the shift from the "nice-to-have" idea of a digital showroom to an immediate and essential business requirement.



Luxury brands with operations in Italy and Asia - where much of the supply chain resides, as well as where Covid hit the hardest - faced some of the most severe challenges at that time. And almost overnight, DPC went from being conceptual to a tangible and indispensable asset, with average maturity rising 89% between 2020 and 2022, reports Kalypso's DPC survey.

Time And Cost Savings, Fewer Errors, And More Usability

Today, despite ongoing disruption being the prevailing mode of fashion, DPC has become better understood as an ecosystem, not as a single solution. And because of its fragmentation and complexity, as well as because fashion companies are no longer in emergency mode - the nature of demand for specific tools has scaled back slightly from a pandemic-era high.

"Overall, the demand for DPC is still there in the supply chain, and it's still growing, but it's not growing at the rate that it was when digital was the only game in town," Levin told me. "On top of that, every buying team has a different appetite for DPC based on how long they've been in the industry, their age, what they're comfortable with.Because at the end of the day, they are accountable if something isn't a true facsimile or something else related to the technology goes wrong."

This raises a key point: while there are undoubtedly suppliers who are taking the lead on adopting 3D / DPC tools for their own purposes, or to improve their competitive position, overall DPC adoption in the supply chain is still heavily influenced by brand and retail customers. And if those brands are not placing full trust in digital assets in their own in-house decision-making processes, it's unlikely that their suppliers will have the cachet to change their minds - especially when any breakdown of the process will likely end up being laid at the manufacturer's door, the same way it typically is in purely physical sampling and production workflows.

The supply chain market for DPC, then, is a mix of those who have pushed forward with strategies based on their own initiatives or the urging and support of their customers, , and others who are still in the process of navigating its adoption, and who are perhaps taking a "wait and see" approach to determine whether this stage of the 3D gold rush in fashion is going to be sustained.

As Head of Digital, Levin has had the challenge of spearheading Li & Fung's extended network in full-scale adoption of DPC. And in that capacity, he has found that the route to success lies in finding a middle ground between articulating the long-term, transformative potential of DPC, and the practical reality of ensuring that deployment doesn't interrupt existing workflows too much. "A lot of my work has been winning hearts and minds. And I'm pleased to say that momentum is building every day. Slowly but surely."



In that combined argument for emotion and raw efficiency, Levin has found that having a physical sample, and at the same time, a digital alongside it, running both workflows in parallel, allows manufacturers to more easily visualise the benefits and articulate those benefits to their customers. Then, one day down the line when in a pinch, there will be much more willingness from both parties to engage with and trust the digital asset because of the high level of pre-existing familiarity. And from there, the trust and confidence in digital workflows grows.

And that trust is also easier to secure than ever, thanks to the greater maturity of the DPC toolset, and the higher fidelity of the average output. That, in combination with the macro environment in terms of climate change and financial pressures, advancements in hardware, and the speed at which one can do things in 3D means that brands, retailers, and suppliers are all buying in more than ever.

"To give an example that sums it up, in the past, when I was doing this kind of work, it would take ages," said Levin when I asked him about how attitudes to 3D design, development, and simulation in particular had evolved alongside the maturity of the software itself. "Whereas now I can produce the same type of work in a few minutes, and at a higher quality."

The Holy Grail For Digital Assets

On the factory side, the response to having more powerful, intuitive, accessible and accurate tools has been largely positive. There is a lot of interest today in replacing manual, iterative, and analogue steps with digital ones, and Levin explains that he regularly engages in conversations with suppliers about the kind of hardware they should buy, and what sort of training they need. "We are all working towards the holy grail of DPC," Levin continues. "Where you build something on your particular 3D system and it automatically creates the pattern for you. Then, one would be able to easily send that file to the factory, and they'd be able to use it without difficulty. From there, they then could use that pattern and put it all together."

This holy grail, where the 3D file serves as the product definition and actually drives production, still may be a bit of time away, but many of the foundations are falling into place. "It's very, very early days, this sort of interoperability with regards to the factory side," says Levin. "But an encouraging sign is that when we create tech packs to send to factories, we more often than not include the 3D cards. This provides an immersive view, where all the details are very clear." For some factories, the team sends turntable renders, allowing the supplier to see a slow moving video file that gives a view of every angle of the item. This has been really effective and leaves less room for interpretation errors than a flat image. "There are more and more factories getting trained up in CLO [and other tools]," says Levin.

So while fashion is not yet ready to design, develop, test, and manufacture solely based on a digital asset, Levin (and other brands and suppliers that The Interline has spoken to off-the-record this year) believes that things are moving in the right direction to elevate the DPC maturity of the entire industry by providing greater connectivity between the sourcing and supply base, and its brand and retail customers.

Motivations For Progress

One of the lessons that COVID taught the wider fashion industry is that if something needs to be done seriously enough, it *can* happen; necessity is a powerful motivator. In that case it was creating a DPC strategy - fast - and implementing it as effectively as possible. So the next step in the DPC journey for brands, retailers, and suppliers is less a question of whether something is possible and more a question of motivation. Why is it desirable - even necessary - to change the current dynamic?



On the macro level, there are plenty of factors for motivation. Geopolitical tensions in multiple regions, inflation, the rising cost of living, the ubiquity and growing power of AI, and extreme weather due to climate change. Mix them altogether and fashion is facing a heady brew of multi-faceted risk, and it may be enough for the industry to move swiftly and decisively toward a future where DPC, and better standardisation of formats and interchanges too, becomes integral to operations and sustainability efforts across the board.

"I anticipate in the next 18/24 months, we will see even more growth in 3D and DPC for suppliers," says Levin. "That's part of what we're doing now, achieving greater interoperability of technologies for suppliers. And we're making great progress." At the moment, Li & Fung is also working with some clients on a pilot project where they build the garments in 3D and sell them before manufacturing. This could be a way to gauge production volumes, and by doing this there is no overproduction and no issue of markdowns. "You don't have to sew a single stitch until you've got the first sale," says Levin. "There will need to be a fast turnaround time for that manufacturing, but it's something I see on the horizon, and just generally I see things getting faster. I see more decision making power being given to the supplier, slowly but surely."

Sustainability Through Digitisation

Giving greater power to the supplier is something that is critical to the development of digitisation of every sector in Bangladesh (a key manufacturing hub for the fashion industry) as part of the nation's push for greater usage of digital technologies. And hand in hand with digital transformation is sustainability - something that is moving beyond being siloed and is now forming an integral part of brands, retailers, and suppliers' business models, especially in the fashion industry's manufacturing hubs.

An initiative that has been monitoring the situation on the ground that exists between brands and retailers and their suppliers is **Mapped in Bangladesh (MiB)**. The objective of the initiative is to map the export-oriented, ready-made garment (RMG) industry across all garment-producing districts in the country; providing accurate, credible and updated information to all industry stakeholders to enable efficiency, productivity, accountability, and transparency.

Professor Matin Saad Abdullah, Technical Lead at Mapped in Bangladesh offered a suggestion as to how things will need to change to see a real difference in manufacturing nations like Bangladesh, that will result in both better usage of DPC and better practices environmentally and socially. "While traditional supply chain digitisation focused on the product lifecycle, from raw material input to final sale, with the objective of improving product quality and minimising production waste, true transformation requires a shift in this approach. This shift means going further and adopting a new kind of supply chain digitisation that achieves full transparency across all stages."

This goal is certainly commendable, but is much said than done. A substantial challenge is the disparity between the limited data available from brands when it comes to their supply chains, and the kind of comprehensive data necessary for impactful change. "To bridge this gap, companies must aggregate data from multiple, independently verified sources, which is essential for gaining a comprehensive and accurate understanding of the digital transformation's true impact on supply chains," says Professor Abdullah.

This understanding will be what helps benchmark the industry to understand progress around sustainability and digitalisation and how much more work needs to be done. This kind of data driven approach will be critical to putting pressure on each of fashion's stakeholders to do better when it comes to making sustainability a priority and taking genuine steps to achieve it.

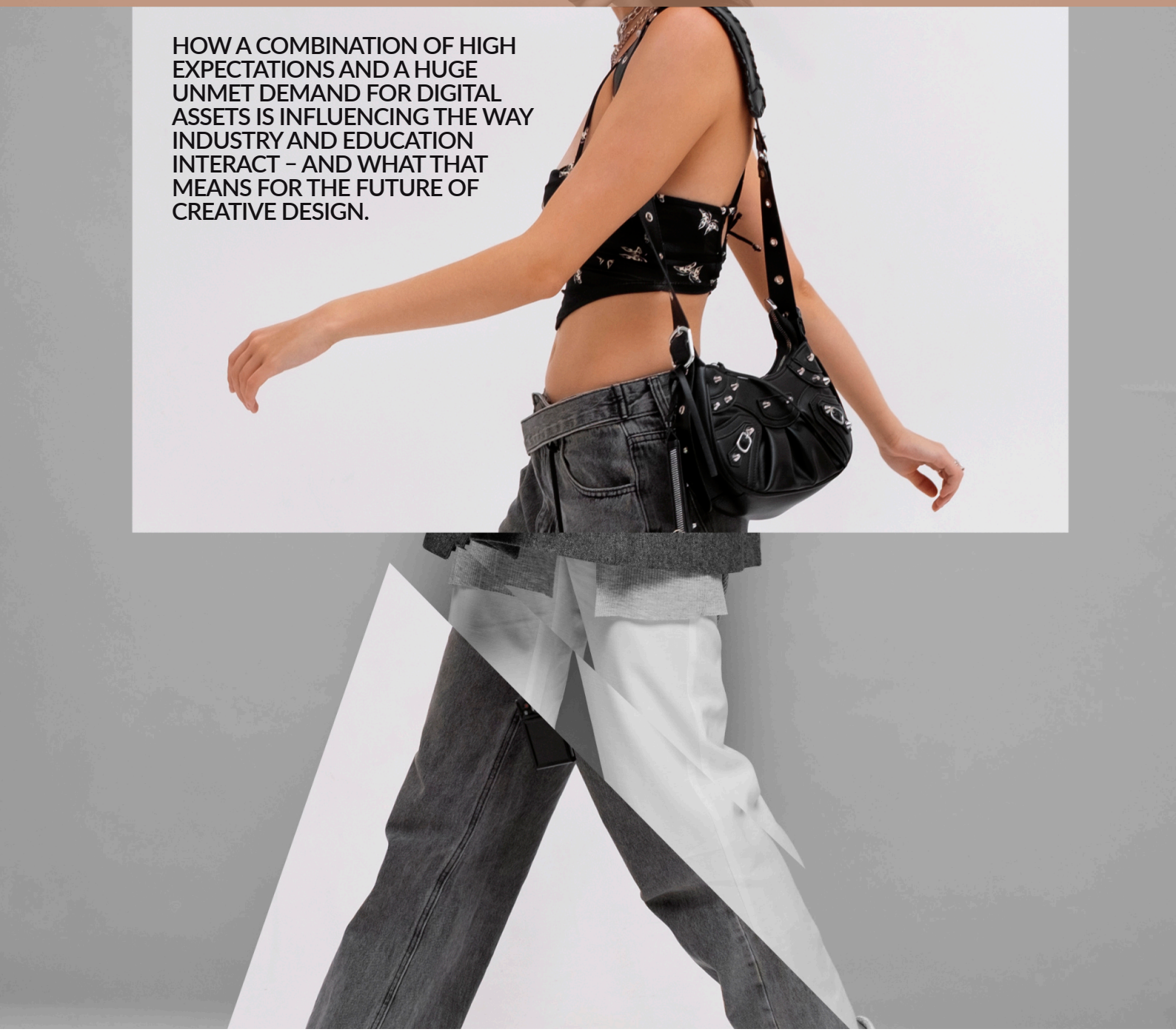
This understanding will serve as a benchmark for evaluating the industry's advancements in sustainability and digitalisation, mapping the extent of progress and identifying areas requiring further attention. This type of data-driven approach is indispensable in compelling the stakeholders along fashion's value chain to elevate their commitment to sustainability, and taking genuine steps to achieve it.

Hesitancy To Harmony

The driving force behind DPC's evolution is not confined to brands or retailers alone; suppliers have long been part of the DPC conversation, and are expected to soon play a big part in overcoming challenges in integrating 3D assets, connecting with manufacturing processes, and building team capabilities. Everybody - even those that are hesitant - still recognise this is the future of the industry. We need to move faster, we need to move cheaper, we need to move with less. To limit or eventually eliminate carbon footprint. We need to have fully integrated systems that go from designers working in 3D, that creates the pattern that will then link in with the factory to do overlay planning. Then after that through to e-commerce and other spaces for the consumer.

This won't happen overnight, but with all stakeholders playing an active role in DPC's adoption across the value chain - the future of fashion is heading in the right direction, with deeper digital transformation of the production process and greater collaboration with the valued partners who bring ideas to life physically as well as digitally.

DANCING WITH THE FUTURE: EMERGING TECHNOLOGY AND THE NEXT GENERATION OF CREATIVE PROFESSIONALS



HOW A COMBINATION OF HIGH EXPECTATIONS AND A HUGE UNMET DEMAND FOR DIGITAL ASSETS IS INFLUENCING THE WAY INDUSTRY AND EDUCATION INTERACT – AND WHAT THAT MEANS FOR THE FUTURE OF CREATIVE DESIGN.



MICHAEL FERRARO, EXECUTIVE DIRECTOR, FIT DESIGN AND TECHNOLOGY LAB, NEW YORK

Mr. Ferraro is the Executive Director of the FIT Design and Technology Lab (DTech) at FIT and is responsible for Industry Partnerships and Collaborative Programs at the college. Creative technologist, researcher, artist and educator, Mr. Ferraro's career spans the worlds of computer animation, software development, virtual reality media production, fine art, commercial entertainment and higher education. In 2015, working with students, he won a NY Emmy for Graphics and Animation Supervision for a series of PSA's entitled "Best of the Bronx". During the 90's, Mr. Ferraro built and exhibited large scale Virtual Worlds in contemporary center's around the world. He made his first picture with a computer in 1969.

Crazy Tempos

It's remarkable how deep the technology stack for modern creatives has become. The current baseline expectation for emerging designers is to be proficient in vector-based drawing tools, to be able to do things like; develop compelling visual presentations, be equipped to shoot and process digital photographs, produce and edit video and audio, animate graphics, use 3D programs, organise social media campaigns, and even to build virtual worlds using real-time game engines.

And this is all in addition to the primary expectation to develop all manner of concepts, products and messages with new tools that have radically transformed the nature and purpose of work, how we communicate, and what we care about.

Software and hardware developers are inventing new products at the speed of light while designers, retailers and manufacturers are frantically trying to incorporate those products into the work. As an observer, it is a little like being at a silent disco where everyone is listening to a different musical track. As you can imagine, it can be a little chaotic.

Not that long ago, relatively simple programs like Microsoft Excel and Adobe Illustrator were challenging the conventional norms, processes and expectations across the fashion industry. We are now in a vastly more complicated world. Each new development has added another layer of knowledge, proficiency and agility expected of creative teams.

And now 3D and digital product creation have opened up an entirely new universe of opportunity. Not only are they changing the way designs are ideated, they have also enabled radically innovative approaches to marketing and retail – from static renders to the new frontier of real-time experiences.

As new design tools have become increasingly powerful, enabling a seismic transformation of the entire fashion value chain – simultaneously we are now witnessing the rise of generative AI, which is pulling into sharp focus the question of how to best leverage the skills of smart, talented humans in an increasingly (artificially) intelligent environment. All of which creates the need for fashion to help define "smart and talented" in this realm and as well as identifying the best ways to cultivate it.

New Dance Moves

From the perspective of education, and the brands in-industry that will be the homes for the next generation of talent, how do we train students and young creators to be productive in this wild, chaotic world of change? It seems to me that we need new dance moves to keep pace with a performance that's constantly picking up speed, and constantly changing time.



Image provided by FIT Design & Technology Lab

Education, especially, is at an inflection point. Traditional models of pedagogy and disciplines that have roots in 18th Century ideas surrounding classics and the enlightenment could benefit from some updating. Don't misunderstand me, I firmly believe that being cognisant of history, philosophy, art and music are essential skills needed by sophisticated, modern creative professionals. This kind of cultural literacy shapes creativity and depth of thinking. But history is just one part of learning to manage a present and a future that are proving to be incredibly hard to predict. The tools available to the educational enterprise are not just demanding slightly different skills, but challenging the very idea of what it means to create.

Higher education institutions like FIT have begun to recognize and implement new methods that can be added to lecture or direct instruction to enhance class time. Next generation education is focusing more on active learning that frees class time for activities that involve higher-order thinking. We need more models that are constructed around collaborative, trans-disciplinary practice and which build on the human to human interaction - models that embrace the messy, uncertain nature of creativity and innovation, and that truly take account of how technology is challenging the core of those ideas and that promote agility and emotional intelligence.

New Dance Partners

As digital product creation continues to influence the way fashion works, education must embrace transformation, and industry must find a consistent source of skilled talent. It seems both are in need of new dance partners. Partners that understand the ebb and flow of transformation. Partners that understand the complexity of business and evolving workflows. Partners that support change and recognize value. Making this all work, and allowing the real potential of digital transformation to take root, is going to be a complicated pas de deux.

The modern value chain brings the previously siloed roles of designer, marketing and business professional into much closer proximity. Fashion designers are now launching complete collections in virtual worlds with compelling animation, sophisticated lighting and accurate material representation – borrowing tools, skills, and best practices from other industries.

This is an opportune moment, then, for our industry to support a different model of education that leverages experiential learning to maximise value for both the industry and students. At FIT, our experience has shown that there is tremendous



Image provided by FIT Design & Technology Lab

value in project-based education with close faculty supervision of talented students working on industry problems. Having the right partner in an innovation environment is powerful and effective. It becomes a master class for students and an opportunity for industry to de-risk innovation as they explore new business ideas.

Solo Moves

Currently, one of the most exciting trends is the way that digital product creation is helping to lower barriers of entry for new designers. With advances in virtual prototyping, low volume, domestic manufacturing, combined with access to world markets through social media – individual designers are now able to establish competitive brands without the cost and weight involved in large volume production. Taken together, these possibilities present a fundamentally different model of fashion available to new creators – a model that sidesteps a lot of the legacy of the past.

Designers today can launch digital collections which only trigger physical production on-demand. This is a powerful step toward fulfilling the promise of a more sustainable fashion industry – one that recognizes the value of individual expression and puts the power at the fingertips of the next generation. It is a strong antidote to the homogenization of mass production and over-optimized marketing. It creates room for the small, customized, and locally produced which helps sustain community on a human scale.

Tradition and Individual Talent

Dancing with the Future requires balance, vision and a commitment to value. We are constantly being forced to identify which is the baby and which is the bathwater - what is worthy and what we can let go. How much of tradition and craft is valid best practice, and how much needs to pivot? To answer those questions, we need to put as much weight on efficiency as we do on human-centred values, skills, craft, and communities. There is huge value in technology, but also a tendency to focus on its ability to optimize narrowly-defined parameters, which can come at the cost of other important metrics. Just as we think about the waste we create in the process of making a product, we need to take account of the vital skills that can be accidentally optimized away.

While we are grappling with how to assimilate change and improve efficiency through technology, we must also incorporate traditional, artisanal skills and the ways in which they have improved our world. They give us legacy and connection. They are human. They are beautiful.



Image provided by FIT Design & Technology Lab



Image provided by FIT Design & Technology Lab

Any industrial control system strategy that creates an unattainable world of standardized identity and over production – much of which ultimately becomes waste – is in jeopardy of devolving. Steering by following the white line in the road can easily lead to a head on collision.

As we progress with technology, we need to stay mindful that a loss of traditional, artisanal craft will be a significant loss of value for everyone. But at the same time, we have to acknowledge that providing different ways of working, like digital product creation and the compounded benefits and challenges of technology, will rightly challenge how the shape and the scope of craft is thought of in the future.

OPERATIONALISING DPC AT NEW BALANCE

HOW PEOPLE, PIPELINES, AND PROCESSES ARE COMBINING TO DRIVE CHANGE AT ONE OF THE WORLD'S BEST-KNOWN BRANDS.



Image provided by New Balance



JARED GOLDMAN,
VP DESIGN, INNOVATION, AND 3D VISUALISATION, NEW BALANCE

Jared Goldman is the Vice President of Innovation & Digital Design at New Balance. He is a creative leader with over 25 years of experience in the footwear industry focused on design management, creative vision, product design and strategy, 3D product visualization and digital operations. Jared has spent his career working for several athletic brands including Reebok and Under Armour. Jared holds a Bachelor of Industrial Design from Syracuse University.



MARY GRIM,
HEAD OF GLOBAL DIGITAL OPERATIONS, NEW BALANCE

Mary Grim, Head of Global Digital Operations at New Balance, has extensive experience in product creation, supply chain operations, GTM operations, project management, digital operations, innovation and building 3D content pipelines. With the majority of her career dedicated to the footwear and apparel industry, Mary is passionate about solving challenges in the dynamic 3D landscape. She excels in effectively introducing new technologies, novel capabilities, and pioneering innovative business processes - from digital content creation to optimized end-to-end utilization.

After making significant, early strides, New Balance have remained at the forefront of 3D - marrying their commitment to heritage with a major drive towards digital content and digital creation. For this year's DPC Report, we sat down with two key figures in the brand's digital strategy to talk tools, assets, and what it means to operationalise DPC.

The Interline: More than two years ago, we spotlighted New Balance's journey towards digital product creation. At that time, you'd been able to translate a lot of the pioneering work you'd done in design and development into downstream visualisation - which was something a lot of brands at that time were working towards as a reaction to the sudden, pandemic-era shift to eCommerce. Since then, that use of digital assets as a replacement for product photography has become a major driver for scaling 3D / DPC industry-wide; everybody wants to replace buyer-facing assets with digital ones. But what's interesting is that New Balance is now almost coming full circle, and you've since spent a lot of time focusing on design, and asking some big questions about what the next stage of that evolution looks like. Why are you placing that renewed emphasis on digital design and development, and how does that fit into New Balance's overall product creation process and route to market?

Jared Goldman, VP of Innovation, Digital Design & Operations: When we first started with digital design, we had a simple goal: to have designers working and showing concepts in 3D vs 2D illustrator. The ability to make decisions and for non-creatives to understand an idea is much higher when looking at a 3D asset. The more we've gone through this process - getting deeper into digital product creation - the more that target has shifted, in several different directions.

Downstream, we want our digital teams to be able to create assets and visuals and experiences that photography can't do. It might be animations, product information spotlights where we're exploding shoes into their individual components - whatever the format, the aim now is to use digital tools and assets to be as expressive and engaging with product storytelling as we can be, without the constraints of having to put a shoe in front of a camera.

Within product creation, we're really focusing on making the initial design stage faster and better by encouraging all our designers to work in 3D from the start. Looking at a 2D sketch, you're always going to be trying to guess what the product should look like. But if you and your colleagues are working with a 3D asset then everyone's looking at the same thing, with no room for interpretation, and you're getting the ability to make more accurate decisions and ultimately get to a final product quicker, without any compromises.

Something we've started, and we're going after in a big way over the next couple of years, is the digital



Image provided by New Balance

side of product development and production - whether the digital asset can serve as the tech package. We're constantly asking ourselves questions like, "what is a 3D tech pack going to look like?" and "what do technical specifications really need to look like in general?" because that, to us, is the next logical step.

And we're also working on bringing all those things together in a way that just helps people work better together. We've really done a lot of work with Gravity Sketch over the last couple of years, and being able to design, review, and collaborate in VR opens up the possibility to cut a huge amount of time out of the whole process. People have always talked about digital samples, and how much faster and more sustainable they are than physical ones, but the ability to have a designer wearing a headset in the US, reviewing a model, in real-time, with a partner at a factory in Vietnam - that's on a whole different level.

So I think everything we're doing with digital assets and tools, in design and beyond, is in service of making smarter decisions and getting the best possible products to market faster.

The Interline: What does it mean to really operationalise all those different objectives and workflows? How are you approaching the task of making 3D design and development a repeatable process that becomes the standard for New Balance's designers? And how do you work to make digital assets the cornerstones of those other processes?

Mary Grim, Head of Global Digital Operations: There's a lot to unpack there, obviously, but the best summary is that we're very focused on having the right tools and processes to facilitate everything Jared just spoke about. Realising that value of the content we are creating is about having the right systems (tools, skills and processes) for every part of the digital ecosystem.

So from that point of view, I don't even believe it's about thinking in terms of assets any more. The kind of digital pipelines we're building obviously carry assets a but really operationalising it all is about standing up people and process with our digital creation capabilities. It's about training, learning by doing, and anchoring digital creation in the day-to-day. It's the side of DPC that isn't as outwardly exciting because it's not directly about the product, but it's all necessary to bring that vision for a complete pipeline to life, ensuring workflows and processes scale.

It's not just about learning new tools; it's about really understanding what digital content and digital products are. I talk a lot about this all being part of a programme of digital literacy, and I think that's a useful way to think about it - because you can continue to technically improve at creating digital product without automatically getting better at understanding and seeing digital product well enough to critically assess and make decisions with confidence.

"IT'S NOT JUST ABOUT LEARNING NEW TOOLS; IT'S ABOUT REALLY UNDERSTANDING WHAT DIGITAL CONTENT AND DIGITAL PRODUCTS ARE."



Image provided by New Balance

In that context, the important thing is that this is a vision we're going after step-by-step. So probably the most vital thing is to align everyone on priorities, which means going back to basics and making sure that everyone - top-down - agrees on which areas of digital transformation to prioritise and pursue, because there are just too many exciting opportunities to pursue them all at once.

We have a wildly talented team at New Balance, and I don't just mean in design. I'm fortunate and energized in that I get to work with people who recognise that getting the most out of these opportunities isn't a matter of adopting new digital tools, but instead thinking about what their priorities are, and how digital can help change the way we do business.

And honestly, I think this is something people underestimate. Obviously, every business, and every department has priorities, but actually aligning priorities specifically across the brand is mission critical to successfully moving forward and scaling big ideas like DPC. The costs, complexity and change management involved cannot be managed successfully in a silo.

Jared Goldman: I want to support that, because Mary and I are working together on our roadmap, and having everybody aligned to it is incredibly important when you're asking people to change. If we want our factory partners to invest in Gravity Sketch, for example, and to buy VR headsets, then those factories are going to need to see and share in a clear vision for where we're going, and why we're asking them to spend money.

The same goes for senior leadership: there has to be a very clear business case for change, and while sometimes it's an easily-measurable return on investment, in others it's more a case of laying the groundwork for a different way of working in the near future. In every case, you need everybody on board.

And it's important to be selective about what you want to achieve. There are so many possibilities that open up when you hit different levels of digital creation maturity, so you have to be careful about concentrating on particular areas, not spreading yourself too thin, and determining the right speed and scale to target. Do you stand a better chance of success by testing or piloting a new tool or process, or do you potentially secure more uptake by saying "this is the way we're going to work now, and we'll support everyone in making the transition"?







Images provided by New Balance

That's a situational question, and I don't know if there's a single right answer. We've definitely experimented with both ways. But whatever route you take, having people truly aligned to the direction is going to be essential.

The Interline: How do you go about building trust in 3D for your internal teams and supply chain partners? You've already reached the stage where you're successfully selling based on digital assets, and you're able to conduct final line reviews based almost entirely on digital assets - having people make mission-critical decisions in 3D. But there's a long journey to get universal trust and acceptance, and that's a journey a lot of brands are still on.

Jared Goldman: That's an ongoing thing. We've made amazing progress, and I know there's more to come, but it's a big undertaking and a really high bar to clear when you're not just challenging the design tools people are used to using, but maybe even starting to re-evaluate the entire go-to-market calendar.

There were times, during COVID, where we had no choice but to make decisions from a digital sample, and that definitely helped to prove the point that people didn't always need a physical sample. But there's also a careful balance to be struck between having a digital-first mindset, where you create in 3D by default, and how close the link is between those 3D assets and the final shoe. That's an area where you only build trust through time, repetition, and improvement - you keep making 3D assets and you keep making physical shoes, and progressively those two things become closer and closer to one another.

So I think time and progress will take care of a lot of that, but people will also need to update their mindsets. All of us buy things online, sight-unseen. And yes, we end up returning some of it, and the stakes are lower when you're choosing what to buy instead of what to make, but as a society we've crossed that river and people are comfortable making buying choices without touching or feeling the products.

We're not asking product teams to never make physical samples, but as an industry we should be encouraging those teams not to make three different upper variations, physically, before they choose the one they want to progress. We should be making those variations digitally, and people should be able to trust what they're seeing enough to make those choices with confidence.

Beyond that, digital creation potentially unlocks some much deeper changes. We work on an 18-month calendar, and that hasn't really changed in a long time, even though we have all these new tools designed to take time out of the process. It's a big ask to change a structure that's existed for so long, but things have changed and there's that ambition I mentioned to really build a 3D tech pack, where your 3D object contains all your technical specs, materials, data and so on. And when the environment and your own systems have altered that much, at what point does it stop making sense to just keep working to the same calendar and using the same processes? I think greater trust gets you closer to an answer there, too.

Mary Grim: From a digital perspective, I think all the right people are now pushing in the right direction,



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and based on where we are in our journey we are aligned on a vision based on first-hand experience. Anyone who's worked in the industry for a while only needs to think back to the first time they saw a 2D sketch, in their first role, and felt a bit disconnected from the people around them who spent hours talking about the sketch as though the product was in the room with them. Making the leap to then trusting and working with a representation of a product instead of the physical product was a muscle that had to be developed. The same thing is happening with 3D - with the qualifier that there's less of a distance from a 3D model to a physical product than there is with a 2D sketch.

People really do learn by doing. And while we're definitely at different stages in footwear and apparel we're passionately driven to build these pipelines and support the brand in acquiring the digital literacy we need to make the most of them.

The Interline: The digital literacy you're talking about is an important element, because user adoption is still often cited as one of the barriers to scaling digital product creation. It's one thing to tell people that 3D is becoming the standard way of working, and another to support the community, across your entire value chain, in making that transition.

Jared Goldman: The route and the timeline to that literacy and adoption is going to vary depending on the audience you're talking about.

"WE RECOGNISE THAT IT'S NOT EASY TO CHANGE, BUT WE'RE FINDING MORE AND MORE THAT GIVING PEOPLE THE RIGHT SUPPORT, AND LETTING THEM SPEND ENOUGH TIME REFINING THEIR SKILLS, WORKS."

For designers, it's a matter of using the tools that make sense for them, for a period of time until an unlock happens. We've seen that when designers work in Gravity Sketch for 40 to 50 hours, for instance, there's a click - a point where people reach a level where a wider possibility space opens up. And even though we're seeing a lot of value from our work with Gravity Sketch, we don't want to be prescriptive about what tools people use to create - as long as they're creating 3D models that we can use afterwards. Different tools work for different people.

We also offer a lot of training and support to help make this as easy an onramp as it can be. Because there's definitely an intimidation factor when one designer shows up and they're spinning 3D assets around, and zooming in and out, and another has a 2D sketch to show. So we want to make it as straightforward and as non-intimidating as it can be for people to acquire those skills, which means training directly from the Gravity Sketch team (who've been a great partner for us) as well as other designers sharing knowledge around materials, textures, and so on.



Image provided by New Balance

We recognise that it's not easy to change, but we're finding more and more that giving people the right support, and letting them spend enough time refining their skills, works.

Outside of design, I think the aim is not to have a learning curve at all. The goal with anyone viewing and interacting with a 3D asset is for them to just be able to trust what they see and use it as a decision-making tool the exact same way they're used to doing with physical assets and other data sources.

The Interline: Let's talk about that pipeline from design, because while you're keen on people using the tools that work for them, you've also put a lot of work into creating a more intuitive starting point in Gravity Sketch. The aim there is to unify VR design and collaboration - bringing people into the same virtual space to look at the same product - as well as allowing your designers to create model geometry that's on a par with the 3D CAD mainstay platforms. How did that come about, and how does it integrate with the rest of your 3D pipeline?

Jared Goldman: We definitely have a mix of both VR and flatscreen tools: there's a huge group of people who use Modo [the 3D modelling toolset from Foundry - Editor] but our experience of using and scaling Gravity Sketch has been really interesting, and we're excited by the results.

When we first heard about it, I was a little bit apprehensive. After all, working in VR isn't something many people were used to and like a lot of 3D teams there was a very real scepticism around bringing yet another tool on board. But then we had a couple of designers who really took to it, and other people picked up on the possibilities pretty quickly and totally organically - mainly because the actual interface is so intuitive.

That sounds like a weird thing to say about an immersive, VR tool, but once people get past the idea that they need to wear a headset, and that they're designing in a digital environment, the actual controls, the dashboard, the modelling tools and so on are all pretty simple.

Think about it this way: if you'd never designed a 3D model before, would you find it easier to physically draw a line in 3D space, or to plug in coordinates on two X/Y axes? One of those instinctively feels more like hardcore engineering, and the other feels

closer to the spirit of footwear design. I think it says a lot that the team at Gravity Sketch are designers themselves, because they've created a tool that gets straight to the heart of the craft.

But the really interesting part is how far we've been able to take things from there. When more people started picking Gravity Sketch up, we thought it would just be a cool sketching tool that our designers could have fun with. Then we started to hire more people who were experts in Gravity Sketch specifically, and they were able to create concept models that were the equal of what people were building in Modo, and then those could be taken into Keyshot where we'd add materials, lighting, and textures - and suddenly we had a super-strong concept faster than ever, with a more natural workflow for creating it.

Those two things - the intuitive interface and the ability to create models that then become part of the existing pipeline - were where the momentum came from. People actively wanted to use Gravity Sketch, so we started adding more people who specialised in it, and we worked with the Gravity Sketch team on training that incorporated real projects, which made a huge difference.

The final piece is that we paired up with Gravity Sketch on our Pensole Academy class over the summer. Every student who came into that class was given a VR headset a couple of weeks in advance. Our objective with the class was to have all the students create and collaborate in Gravity Sketch and not do any 2D illustrator drawings. That's a pretty radical idea for a class teaching footwear design.

Over the 5-week class, students put in the hours using Gravity Sketch - our highest user was up over 75 hours. You could see the difference in the work for those that put in the time. Alyssa Duhart was one of the top students in the Pensole class, who is now a student ambassador for Gravity Sketch since completing the class. She also had the opportunity to talk at the 2023 Gravity Sketch Around Festival last week, with me, and will be a New Balance Apprentice in January. That success story is a strong testament to the fact that it's all about putting the time in with these tools, and embracing technology.

Mary Grim: The exciting part for me is that this is really laying the groundwork for new possibilities, not just learning new tools in isolation. We're always thinking about foundation and the future state: we need to make sure we're nailing the fundamentals today, and giving people the right tools and capabilities, but our eye is firmly on what this all unlocks for the future. It's not just about a different way of creating; we want to see how far we can go with the tools and partnerships that enable an optimised digital pipeline.

The Interline: Let's talk about taking digital assets upstream. Separately from the design and development community, a major part of operationalising 3D working is building the same level of trust and collaboration with external



Image provided by New Balance

partners, and demonstrating the return on investment potential for them. You've mentioned the vision for 3D tech packs, and the need to align everyone with a common vision: how does that collaboration with vendors and factories work today, and how are you aiming to build on it in the future?

Jared Goldman: We want whatever designers are creating to be able to move seamlessly through the digital process. So, if I'm starting a model in Gravity Sketch, I want to be able to save the file that can then be opened by Modo, so the team using that can build on my work and finalize it. And ultimately, it would be ideal if we could take that further into manufacturing and use the same asset to drive pattern cutting.

When you're thinking about a pipeline, it's not just one-way - it's a circle. If we're creating those assets the right way, they can come back to us after the factory has looked at them, and the designer can edit them based on their feedback. A successful workflow is one that's built on an asset that's usable by everyone.

If we create a 3D model that everyone here is happy with, but then the factory can't actually use any of the data and somebody there has to recreate it in another program, then that's really defeating the purpose. And that's something we're really strongly focused on at the moment: a way to keep the flow that we have going in-house moving throughout the supply chain, so that there's no need to revert to 2D, or restart or reverse-engineer anything in between design and production.

Mary Grim: What we're talking about here: that's the true pipeline. We're not designing just for the sake of designing in 3D. Operationalising digital product creation isn't about finding a single solution that does everything, but it is about meeting people where they are, in balance enabling creative freedom and connecting the dots across platforms.

The goal is to get people into the 3D space, get them comfortable, and get them designing, and from there the goal of operations is to create the connections so that work can continue to flow.

When it comes to actually connecting tools and codifying standards, I think that's the work the industry as a whole needs to undertake over the next few years.

The Interline: What do you see as the major possibilities that operationalised 3D could unlock for you in the near future? We've already talked about making better-informed, quicker creative decisions, and telling the right stories through sales and merchandising, but there still seems to be a huge amount of potential to tap into. How do you choose what to go after next?

Mary Grim: I think for the brand, without giving too much away, our priorities are about really optimising our content. There's a huge amount we can do with what we're building, and the biggest opportunities in front of us are going to be shaped by our ability to make 3D content that's as universally usable as it can be.

That's the biggest challenge for operations, but it's also something I look at as being an endless possibility, because we're at the stage where physical products and digital products are equally important. They are different pipelines with different requirements, but they're so tightly related that we have the opportunity to use the digital to inform the physical in a way we never had before.

I think it's important to keep that perspective. This whole digital unlock isn't about incremental changes, it's about having the chance to do things completely different, and to really rethink how we show up, internally and externally. We're very cognisant of the scale of the opportunity here, and it's heavily embedded in our prioritisation and decision-making for the near and the longer term.



Image provided by New Balance



Crate & Barrel Virtual Home Store, Obsess

VIRTUAL STORES: THE ULTIMATE ENDPOINT FOR 3D ASSETS

AS DPC STRATEGIES BECOME MORE AMBITIOUS, AND BRAND AND RETAIL BUSINESSES LOOK TO MAXIMISE THE VALUE AND USABILITY OF THEIR DIGITAL ASSETS, THE EMERGENCE OF A NEW, 3D-NATIVE RETAIL CHANNEL PRESENTS NEW POSSIBILITIES.



Neha Singh, Founder & CEO, Obsess

Neha Singh is the CEO & Founder of **Obsess**, an experiential e-commerce platform enabling brands and retailers to create visual, immersive, 3D virtual stores. The mission of Obsess is to create the next-generation online shopping interface that transforms the traditional e-commerce thumbnail grid into a 3D, interactive, social and highly engaging experience. Obsess has created over 300 virtual stores for leading global companies—such as Ralph Lauren, Charlotte Tilbury, Coach, Corona, L'Oréal, Unilever, Mattel, Crate & Barrel, NBC Universal and more.

We live in a world that is 3D. We spend nearly half of our waking hours, if not more, on the internet—which is primarily 2D. Isn't it inevitable that this 2D medium, in which we spend most of our time, will ultimately match our ever-evolving, immersive 3D world?

Today, retail and digital leaders have already started to digitise product assets, in order to help drive e-commerce sales. The most common use case being the ability to see products in 3D on Product Detail Pages and spin them around in 360 or view them in the physical world via augmented reality (AR).

But, these experiences are still clunky.

And while siloed 3D elements have proven to increase consumer purchase intent, the potential sales opportunity for brands has still not been fully unlocked.

Enter: virtual stores. Virtual stores are web-based, shoppable 3D environments that transform the traditional flat e-commerce thumbnail grid into something that is highly visual, contextual and customized to a brand's unique story. Virtual stores contain digitised versions of physical products, acting as an ideal endpoint for 3D assets.

A recent survey of 150 brand and retailer decision-makers confirmed that 88% of companies that have invested in virtual stores have seen increases in their total sales as a result—underlining the necessity of virtual stores in boosting 3D product sales, and thereby unleashing their full potential.

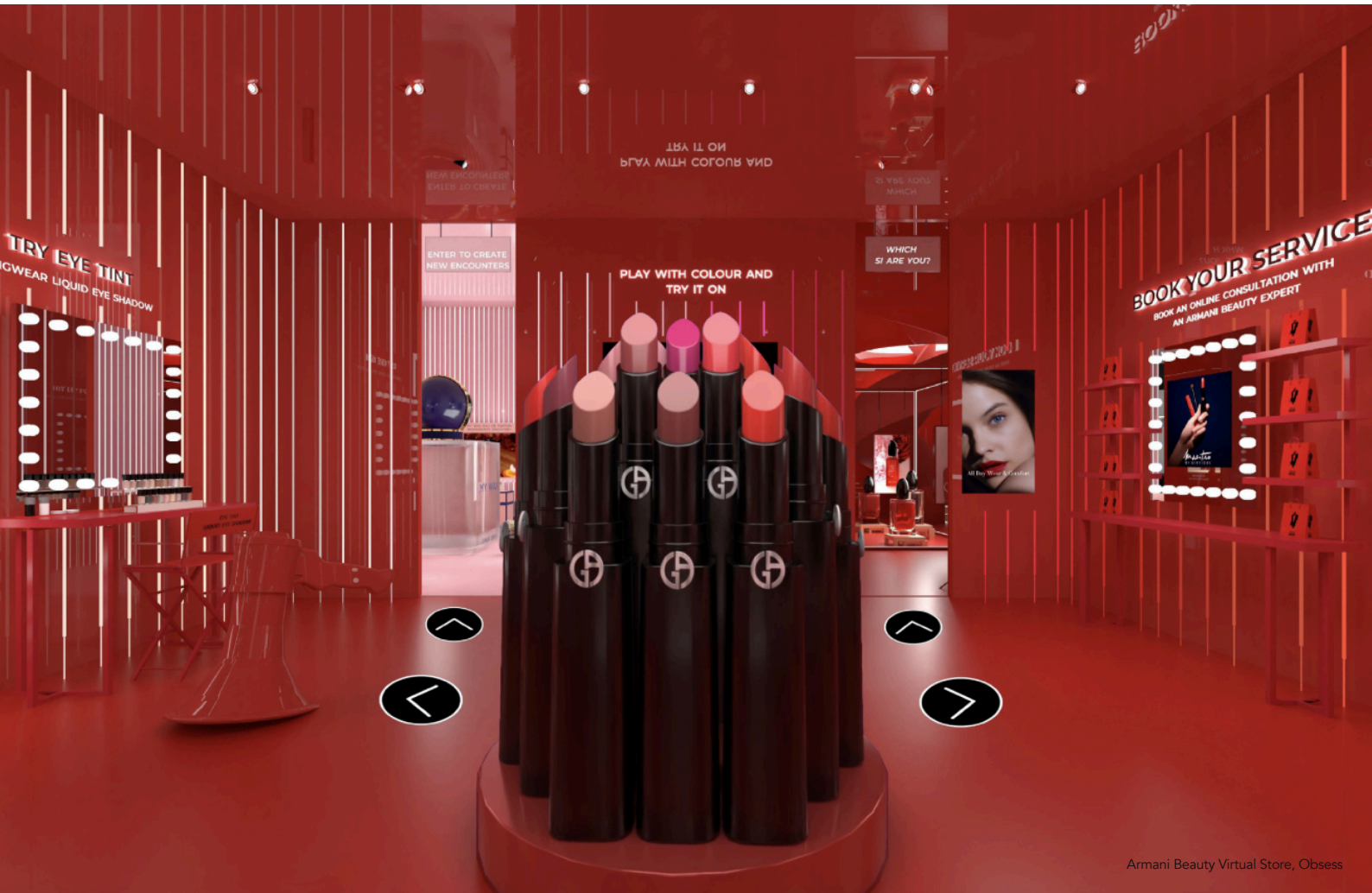
My company, Obsess, is a software platform that enables brands and retailers to create interactive virtual stores on their websites. Obsess is the most scaled virtual shopping platform in the industry, with over 300 virtual stores and experiences in categories ranging from fashion and beauty, to CPG/FMCG, grocery, home and media—with the most data in the world on how consumers behave in 3D shopping environments.

When Obsess creates a virtual store for a brand, we typically include one of two product types: 2D flat-lay images of physical products, shadowed and merchandised to mimic a 3D product, or CGI-rendered 3D products that are modeled to look exactly like their physical counterparts. There are benefits to both product types. Flat 2D images are very accessible assets that nearly all brands have for their e-commerce product listing and detail pages. 3D products take more effort to render, but they can create a more holistic-feeling virtual experience as they are typically higher resolution and they react more dynamically to lighting and shadowing.

Regardless of the product type, virtual stores are crucial for creating context around any digital asset. While 2D digital environments permit enhanced exploration of 3D products—for example, by spinning a product around, or by zooming into its components—3D digital environments provide an opportunity for immersive product and brand storytelling.

Within a virtual store: a shopper can use 3D products to build and visualise a new outfit, or understand how a product's colors and textures look against different types of lighting.

For example: Obsess worked with Crate & Barrel this fall to launch a virtualised version of their new flagship store in New York City's Flatiron neighborhood. The virtual store contains over 450 3D-modeled products, set within eight virtual "rooms" that each contain photorealistic 3D decor and animations. The virtual space contains interactive personalisation tools that



Armani Beauty Virtual Store, Obsess

let customers visualise their own sofa and living room set or build their own bouquet using the brand's selection of vases and botanicals. The 3D decor replicates the preserved neoclassical columns and original volcanic ash tile walls from the physical store, paying homage to the energy and dynamics of a period that inspires the brand's aesthetic.

Likewise, virtual stores create a more dynamic environment for digital product merchandising. Through spatial analytics, these 3D environments can be optimized regularly based on real-time data. Similar to the way that retail managers in physical stores test different merchandising angles in display cases or aisle placements, virtual store managers can easily drag and drop products into different areas of a 3D environment to test for click to transaction behaviors. This process is also much more time and cost-effective than swapping out merchandise in a physical environment.

An added benefit of virtual stores is that they effectively gamify the shopping experience for 3D products. According to a survey of U.K. respondents: more than three in four people now play online games. This gaming-fluent audience of consumers expect every one of their touchpoints online to be highly visual, immersive and play-centric.

Just as social media once acted as the throughline to millennials, gamified environments are now the entry point for companies to connect with Gen Z and younger audiences.

In order for brands and retailers to succeed in today's age of shopping, they need to adopt gamification as a central point of their digital strategy. According to a recent report in partnership with Coresight Research: 68% of companies that have invested in gamified shopping have seen an increase in time spent visiting their websites and apps—underscoring the value of gamification in increasing brand engagement, relevance and memorability.

The transition from traditional 2D e-commerce platforms to engaging, immersive 3D virtual stores marks a significant evolution in the retail landscape and a pivotal moment for the display of 3D assets. As consumers increasingly seek richer, more interactive online experiences, the integration of 3D elements and gamification within virtual stores becomes an essential tactic for brands and retailers.

By embracing the potential of virtual stores, companies are not only poised to increase sales—but also to create lasting connections with their audience, shaping the future of digital retail in a world where authentic, immersive content reigns supreme.



LANEIGE Virtual Beauty Store, Obsess



GAMES X FASHION - UNPACKING THE AUDIENCE AND ANALYSING THE VALUE PROPOSITION

THE FASHION AND VIDEOGAME INDUSTRIES HAVE BEEN GROWING PROGRESSIVELY CLOSER, SHARING TOOLS AND, INCREASINGLY, SHARING AUDIENCES. WHICH CROSSOVERS HAVE MADE THE MOST IMPACT? AND WHAT ARE THE MOST COMPELLING NEAR-FUTURE OPPORTUNITIES?



BY CLARE TATTERSALL, DIRECTOR & FOUNDER OF DIGITAL FASHION WEEK, CURATOR OF THE DRIP

Clare Tattersall is the founder of Digital Fashion Week, and the curator of The Drip – an haute couture digital fashion boutique.With two decades of experience innovating at the intersection of fashion design x technology, she launched DFW to provide a lens into the future of the fashion industry by exploring unconventional approaches to how we interact with fashion. Before founding Digital Fashion Week NY, she co-created a software to align the design-to-sales process into a single virtual experience and developed wearable technology products.

As two seemingly disparate worlds collide - fashion x gaming - a new narrative of innovation, creativity, and demographic evolution emerges. On September 7th 2023, hosted by the Epic Games Innovation Lab in London as part of the Digital Fashion Week series, three panellists, Sallyann Houghton of Epic Games, James Gaubert of Republiqe and Tracy Greenan of AURA sat down with Noelle Reno to discuss **Games x Fashion — Unpacking the audience and the value proposition.** And I wanted to recount that discussion - and draw some conclusions from it - for The Interline's DPC Report, because the synergy between these two industries could potentially shape the futures of both of them.

Understanding that fashion is a means of expression and that games are a rich visual playground, the panellists discussed the synergy between the two

industries and explored the potential benefits and challenges for fashion designers. Taking centre stage in the conversation was audience engagement, but also the Web3 concepts that inherently emerge, such as the value of collaboration and innovation, the panellists unearthed the challenges such as interoperability especially in the context of utility and functionality.

With some of the panellists discussing their personal experience and successes, it is becoming clear that fashion designers are embracing the vast potential of the gaming universe, not only top luxury brands but also many independent designs are discovering the importance of expanding their brand into the Metaverse.

Successful partnerships between luxury fashion houses like Gucci and gaming giants such as Roblox illustrate this as the gaming industry's established audience engages with both high-fashion brands and new digital assets from all designers, while the fashion world reaches previously untapped demographics.

In this discussion of Games x Fashion, we delve into the intersection of two industries, each bringing its own creative and cultural capital, and together forging a new outlet for fashion that redefines audience engagement, value propositions, and, ultimately, the opportunities for designers.

WHO ARE THE GAMERS?



Let's start by taking a look at some demographics to understand the potential that the gaming industry holds. **Roblox**, with 65.5 million daily active users, is a virtual universe where imagination thrives. The platform hosts a predominantly youthful player base, with kids and teenagers as the primary market. **The Sandbox**, with 4000 daily players, is focused on user-generated content, while **Zepeto** (with 1.5 million daily users) is focused on social simulations and self-expression, catering primarily to teenagers and young adults. In the ever-popular world of **Fortnite**, with 44.7 million daily users, battlegrounds are shared by a blend of children, teenagers, and young adults.

COLLABORATION AND OPENNESS

Gucci's collaboration with Roblox is an excellent example of the convergence of fashion and gaming. In Gucci Garden, the brand introduced exclusive virtual items inspired by its real-world collections. Digital avatars transform into mannequins and, as they move around the game, absorb elements of the exhibition, turning themselves into unique digital artworks. The result: Roblox users acquire exclusive branded virtual items. By embracing the gaming world, Gucci not only expanded its audience but also connected with a younger demographic, demonstrating that the intersection of luxury and gaming is a space ripe for exploration. It allowed Gucci to tell its brand story and to educate a new audience on its values, history and tradition. This collaboration serves as a beacon for other fashion brands looking to fuse creativity and brand values with the gaming culture.

INNOVATION AND INTERACTIVITY

As far back as 2020 Burberry, a pioneer in merging innovation and interactivity in the fashion and gaming landscape, partnered with Google on an augmented reality (AR) shopping experience that allows users to experience their latest collections through AR filters. Users can virtually try on outfits from Burberry's runway show, creating an interactive and immersive connection between the brand and its audience.

INTEROPERABILITY

Interoperability still presents some challenges to the fashion industry, with universal interoperability remaining far in the distance. What is interoperability? It is the ability to move digital assets (e.g. virtual fashion) seamlessly between different platforms. This still requires a sophisticated toolset across gaming platforms, although some tech companies are providing unique solutions where assets can be parsed through their software to be usable in different games. The Fabricant is one example of a company that is addressing this issue, as their digital clothing designs, created using universal 3D file formats, can seamlessly transition between various gaming platforms. By prioritising interoperability, The Fabricant has ensured their digital fashion reaches a wide-ranging audience across different virtual worlds and highlighted the need for a universal approach to digital design.

UTILITY AND FUNCTIONALITY

Prada is a prominent example of a fashion brand embracing utility in their digital clothing line. Their recent collaboration with League of Legends featured exclusive digital outfits designed to be both stylish and provide in-game functionality. An interesting example of this is where one Prada-designed skin grants players an enhanced gaming experience with unique visual effects. This strategy of adding utility to digital fashion understands the gaming audience's desire for tangible benefits, emphasising that fashion in the gaming industry can offer both style and utility.

Four years ago (which is a long time in digital fashion history), Prada designed an exclusive collection for the 2019 League of Legends' World Championship Finals, building on the success of this partnership, Prada's clothing items and accessories were made available for purchase within the League of Legends game itself. It not only capitalised on the fashion industry's growing fascination with gaming but also harnessed the massive global audience of League of Legends, showcasing Prada's luxury style and commitment to innovation. This relationship between the fashion giant and one of the world's most popular esports was a pioneering move, and shed light on the potential for fashion brands to explore new markets and new relationships with the gaming community.



Digital Fashion Week 2023 panel discussion.

AUDIENCE ENGAGEMENT

Like Prada, In 2019 Louis Vuitton also successfully engaged the gaming audience by thinking beyond traditional fashion presentations. They ventured into the gaming world with a League of Legends in-game collaboration, they created an opening ceremony and even designed a custom trophy case for the League of Legends World Championship. By engaging the audience in these unique ways, Louis Vuitton tapped into the gaming industry's immersive and interactive nature, resonating with a tech-savvy and fashion-forward audience.

In 2020, Gucci became the first luxury fashion brand to create a digital presence on Roblox. This collaboration allowed players to purchase and wear digital Gucci virtual assets, promoting the brand name in gaming and offering their existing audience a new way to buy and collect Gucci assets. Additionally, Gucci partnered with Tennis Clash, a mobile sports game, in 2021 to create in-game Gucci outfits for players to style their avatars, showing the brand's adaptability to different gaming platforms and audiences. These strategic moves have enabled Gucci to access the expansive gaming audience and establish a foothold in the virtual fashion market.

THE NEW ERA OF GAMES AND FASHION



By unpacking the audience and analysing the value proposition of fashion in the gaming industry we can discover a new realm of creativity, technology, and audience engagement. Fashion is always about so much more than 'clothes'. It is about self-expression and story-telling. Fashion designers who are successful understand the story that they are telling and the role of their customers. Gaming is built upon some of these same concepts of story-telling and self-expression, so conceptually the two industries are well suited. But the gaming industry also offers something new – a young audience that can be cultivated, expanded experiences and of course digital assets are usually less expensive than their physical, so independent designers can sell more at a lower price. We can clearly see from the success stories that brands are successfully expanding their reach, forging meaningful connections and providing immersive opportunities for their traditional consumer. Games and fashion, two seemingly different worlds, have converged to usher in an era of creative symbiosis and reimagined value propositions.



THE END STATE FOR DIGITAL PRODUCT CREATION

WHERE IS THIS ALL GOING? AND WHAT WILL IT LOOK LIKE WHEN WE GET THERE?



BY BEN HANSON.
EDITOR-IN-CHIEF. THE INTERLINE

Ben Hanson is the Editor-in-Chief of The Interline - a technology publication for fashion professionals, written by industry experts, and read by brands, retailers, and supply chain businesses around the world. Day to day, he leads a growing, multinational team to address the most pressing challenges affecting the fashion industry's fast-moving digital transformation. From supply chain transparency to digital fashion, The Interline tackles major industry questions through a technology lens.

We will someday reach a point where fashion can say that the scaffolding it needs to support the full scope of digital product creation is built.

This doesn't mean that the work of *DPC itself* will be done. Just as nobody in architectural visualisation, videogaming, or visual effects is sitting back and happily having their jobs completely automated away by a mature pipeline, no-one in fashion is suggesting that the DPC technology and process ecosystem - when it comes into full focus - is going to leave them sitting idle.

When we reach this destination, the craft of designing, developing, engineering, visualising, marketing, and making products digitally, with as few compromises as possible, will still be in incredibly high demand. The toolkit those craftspeople use, though, will no longer have any major missing blocks, data dead-ends, incomplete modules, fragmented standards, or other rough edges.

At the risk of trivialising a lot of tough graft, commercial dealmaking, creative input, best practices, and hard-fought standardisation, the time will come where this all 'just works'. And, like someone standing back after spending years kitting out a workshop to cover every possible eventuality, the industry will find itself asking what it can create, now that the tools are all in the right place. And it'll realise the answer is "basically anything". Which is going to be potent and paralysing at the same time.

That's why I believe that thinking forward to what that kitted-out garage looks like, and getting some advance on that vertiginous feeling of a wide-open possibility space, is a useful exercise. We're all guilty, at one time or another, of becoming so immersed in a journey, or the incremental steps and successes along the way, that we forget to re-evaluate where we're headed - and what the benefits of arriving will be.

And this is where looking at the road that those other industries - VFX, architecture, games and more - have travelled is valuable. Because they, with their comparatively pristine, complete workbenches, are, on average, farther down the road towards their own end state for digital product creation and all-round digital transformation. So, in theory at least, they have plenty to teach us.

But first: how did that happen? How did other sectors steal the march on fashion and build deeper 3D / DPC capabilities and systems, sooner?



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But first: how did that happen? How did other sectors steal the march on fashion and build deeper 3D / DPC capabilities and systems, sooner?

Part of the reason is a simple function of effort over time: on average, those sectors started embracing digital design and 3D product definitions earlier than fashion did. (There were notable brand and supplier exceptions, who did pioneering, early work in 3D in fashion.) An equally large part is down to the nature of the products and components those sectors are designing, developing, engineering and visualising in 3D - and how well those elements have been served by the existing paradigms of computer graphics.

I want to really zero in on the last part. Approximating the direct and indirect optical properties of light, for example, is a hard problem, but one that's had a series of different and progressively better solutions - from hand-drawing based on real reference, pre-baking and rasterisation, to radiosity, ray tracing, path tracing and other methods of simulation.

So if your primary challenge is simulating light to help create more realistic-looking scenes, then you're pretty well-served by the different techniques and tools that exist today, even if none are *fully* accurate. And you've also likely seen serious strides being made in how effectively and efficiently this work is done during your lifetime.





I was 13 years old when the original *Toy Story* came out, and a single frame of that film took hours (or even days) to render on racks of the best local hardware available at the time. I'm now 41, and there's a smartphone on my desk that supports hardware-based ray tracing. It's certainly not going to render anything at the same image quality as a CG film, but the point still stands: I can, if I want, run real-time simulations of reflectance, multi-bounce indirect lighting and other complex calculations at passable frame-rates, alongside rendering characters, materials, and environments that would put that 1995 film to shame - all on a portable consumer device.

Now, this isn't a lesson about getting older around technology. (Although that's definitely a feeling I have as we come to the end of another year!) This is, instead, a spotlight on how far the simulation of difficult things can come, and how fast, when software and specialised hardware are applied to the problem, ecosystems, standards, pipelines and workflows accrete around those core capabilities.

Across those other sectors, a lot of smart people have devoted a huge amount of time and effort to apply technology and ingenuity to solve precisely those kinds of complex problems, which has led to industry-agnostic watershed moments like physically-based rendering (PBR), programmable shaders, particle systems, procedural generation, and much more - all of which have collectively contributed to a pronounced leap in the believability of both offline rendered and real-time 3D graphics, applicable across a huge spectrum of different use cases.

Fashion, by dint of borrowing tools and best practices from other sectors, now benefits from all of these advances. But our industry has an additional, just as computationally difficult, problem to solve on top: material simulation that captures both the visual and the granular physical and performance attributes of fabrics, construction techniques, and the garments, shoes, and accessories that they combine to create.

This is, to be clear, a fundamentally different problem to the task of cloth simulation in film or videogames, where aesthetics and animations take precedence over accuracy, and where garments and materials are manipulated to conform to the desired visual outcome, with form trumping function instead of the other way around. For fashion brands, the mandate is to simulate materials and garments in a way that doesn't just look right, but that behaves with total accuracy at rest and in motion.

So fashion is facing a multi-pronged challenge, needing to use 3D tools to create high-quality visualisations, uncompromising fabric simulation, and also bills of materials, construction and engineering details, sizing and fit, and other elements that are necessary to create digital products that can actually be made - without needing to reverse-engineer those 3D models in other solutions to accomplish the tasks of production.

This is the combined challenge that the 3D / DPC technology vendor community has been collectively and separately working to address. And their successes in individual lanes (and in integrated workflows) is what led to the marked uptick in adoption of DPC solutions that we benchmarked in last year's DPC Report. Some of that upward trend in uptake can be laid at the door of the pandemic, of course, since COVID suddenly took physical prototyping and sampling off the table, but a much larger contributor was the maturity of the technology, and the level of trust that people were able to place in 3D assets - allowing them to make creative and commercial decisions with confidence.

And while digital assets don't always travel well from one use case to the next (at least currently) they can, largely, fulfil most of the purposes that physical assets are deployed to achieve. On that basis, it's easy to see why fashion has forged ahead with DPC strategies even without the proximate threat of the pandemic - because the value, measured in time, cost, creativity and other key indicators, of substituting a digital asset for a physical one has been proven many times over.

Even in those individual use cases, there's still work to be done - and simulation engines are getting better all the time. But realistically the biggest roadblock to completing fashion's DPC technology toolset isn't deeper simulation, but deeper integration, interoperability, and standardisation. At a strategic level, the work of getting fabrics to drape a little better pales in comparison to the importance of making sure that design inspiration, patterns, materials data, avatars, trims, sewing operations, costs, emissions calculations, and other digital product attributes become part of a cohesive, rolled-up "digital twin" And that, by extension, it can all travel through the entire technology estate and into every conceivable use case.

This is the scaffolding that, in fashion, is still very much under construction. And it's also the scaffolding that other industries are now concentrating their attentions on with frameworks and standards like Universal Scene Description (USD or OpenUSD), which are explicitly designed to make collaboration, non-destructive editing, and different intersecting workstreams the standard in computer graphics.

But even while that scaffolding is being built, there are massive, multinational brands that are making huge strategic investments in DPC tools, processes, and talent right here, right now - providing a testament to just how vital they expect these resources and capabilities to be in the near future.

As you're reading through this year's publication (which we recognise is not a single-sitting engagement for most people) you'll see opinions from a range of different brands and suppliers who are at different, advanced, stages of their DPC journeys, telling their stories and sharing their thoughts on where things go from here. And in the last twelve months I've personally had off-the-record conversations with even more brands, across all shapes, sizes, and product mixes - all of whom have major ambitions for what's possible today with digital representations of physical products, and what's going to be possible in the future when those digital assets become more fully-featured digital twins.



Speaking on the record, HUGO BOSS - a company routinely held out, for good reason, as leading the vanguard of 3D adoption - provided us with a new corporate statement that demonstrates just how transformative DPC has been for the company already, and how fundamental it is to the organisation's near-term future:

"To support our vision of becoming the leading premium tech-driven fashion platform worldwide, HUGO BOSS was one of the early companies to explore the potential of 3D and immersive design in fashion. By leveraging cutting-edge technology, we combined creativity with eco-conscious practices to minimise waste, maximise efficiency, and pave the way for a more sustainable future. Our teams can now review designs digitally, bypassing the need to create and ship samples back and forth between the suppliers and vendors. We have already reduced the number of physical prototypes by 30%, and we aim to keep making progress in this respect. We have a goal of achieving 90% 3D product design and development by 2025. Today we have around 600 employees working with these innovative tools. Our ultimate objective is to enable everyone related to product creation – from design to development – to work with 3D at HUGO BOSS."

These are big results and bold targets, but also ambitions that the company has certainly made the right long-term commitments to achieve. And while it's likely to take organisations that are just beginning their DPC journeys far longer to reach them, the hope is that these goals and results will serve as a lighthouse for the wider industry to target.

So let's come back around to that original question. What should it look like when the DPC ecosystem is fully built out to the extent that the full complement of job roles in fashion design, development, sourcing, production, sales, marketing and more can work on either creating, using, or interacting with 3D assets? What is the "end state" for digital product creation?

My personal answer to that hasn't changed in the last few years. I believe the industry-wide DPC toolset and process library can be considered 'complete' when anyone who currently makes a creative, strategic, technical, commercial, promotional, or sustainability choice based on either a physical asset, a flat sketch, or a database is able to make the same choices - with the same degree of confidence - based on a digital twin.

Of course, people will also use those same assets to create new experiences and new possibilities that go far beyond what it's currently possible to achieve using a physical asset or a set of data at the product level, and eventually entire digital twins that model the full set of complexities of their extended supply chain. But in terms of accomplishing the work that's already begun, a digital asset that can stand in for a physical one in every conceivable scenario is an effective measure of success.

Which begs the question: what's the distance from here to there? Obviously the answer is extremely subjective at the individual brand level, but from a whole-industry perspective the solutions are likely to be fairly common: more training, more talent, deeper integration and



interoperability between solutions, codification of standards, collaboration between in-house departments and external partners, and other methods of keeping closer alignment between physical products and their digital twins.

Now, this all assumes that no breakthroughs or alternative approaches emerge in the interim - or anything else that sparks a more fundamental rearchitecting of the underlying technology, or challenges any of the core assumptions of digital product creation in a way that shortens the distance between physical and digital.

But that kind of radical rethink is what the DigitalCore Consortium is proposing. Billed as being an "alliance of global industry leaders who are collaborating to establish a groundbreaking standard and 100% virtual ecosystem for digitisation of systems, objects, and processes," which includes cross-industry organisations, one of the Consortium's key members is **Mode Maison**.

Mode Maison have worked to build what they call a "multi-brand retail platform" on top of the Consortium's proposed framework standard, and they also appear in this report's technology vendor section with a detailed profile and a deeper interview. But I wanted to quiz Steven Gay, their Co-Founder and CEO, about how the DigitalCore standard could factor into a possible end state for DPC, and what "convergence" - a word they use a lot - might mean in an industry with as many moving parts as fashion has:

"The future of fashion and other product-centric industries is going to be defined by increasing complexity and universal digitisation. Trying to tackle those challenges through the classic, piecemeal, computational approach is always going to fall short of the ultimate goal: creating digital products and building digital experiences around them that both accurately represent the interconnected rules that govern the physical world, and that anchor those digital assets in scientific reality. This is what's meant by convergence: building a shared foundation for digitisation and digital creation that's predicated exclusively on data, and that represents real-world materials in a way that's accurate, flexible, and exponentially scalable."

If the DigitalCore Consortium's goals of solving essentially the whole of known physics in a computer sounds like a tall order - it certainly is. And time will tell if this novel approach challenges the current pillars of digitisation and digital creation, but the idea of sidestepping the isolated challenges of lighting, materials, soft-body avatars and instead pursuing a cohesive approach to simulation is, in theory, one that would resonate well with the vision for complete, comprehensive digital twins.

When we think forward to what the future should look like, with the goal of empowering every job role to take any creative, commercial, or strategic decision based on digital assets, it will be absolutely vital for those assets to be standardised, complete, and composable. Instead of just siloed representations of parts and finished products, the ambition would be to create a single, layered, scalable source of truth reflects reality with no compromises, and that allows people to work with it in an additive, non-destructive way.

On the complete opposite spectrum is generative AI, which - currently at least - does nothing to address first principles or fundamental physics, but which nevertheless is capable of doing a strong job of inference, and generating outputs that *look* as though they were



created by a system that understands those principles. And while the focus of this report is on the objectives, structures, and systems of core human creativity, it would be naive not to see generative models approach this problem from the other end of the spectrum, and creating new examples for a range of different use cases.

Do I, personally, see generative AI overtaking essential product creation tasks like creative design and accurate 3D modelling? Not yet. Do I expect it to play a major role in virtual photography, where it can instantly elevate lighting and materials in a finished render? Absolutely. Is it already being deployed in specialised applications like embroidery, material tiling, and other areas that straddle the line between aesthetics and engineering? Definitely.

And while it may not be the case that generative models are creating production-ready patterns, geometry, and styles, there is a strong, looming suspicion that more generalised (although not full general) intelligence is further along its own track than some people realise. If the last year's journey from ChatGPT to Google Gemini has taught us anything, it's not to underestimate the scale of the rug-pull that sudden AI unveilings can accomplish - especially when new modalities are brought to bear.

However the current AI race shakes out, though (and The Interline will be announcing a deep-dive on that topic in early 2024) it's clear that fashion is going to make progress towards that end state vision in unique and idiosyncratic ways, with different pathways per-category, and different philosophies per-brand beneath those. We only need to take a look behind the curtain - as we've tried to do in this year's report - at the way different designers, different brands, different suppliers, and different technology companies work to realise that everyone is building their own scaffolding as they work.

And that makes it difficult for anyone to really take a step back and notice that they're all heading in the same direction. Some companies, like HUGO BOSS and the others that have contributed to this report, are trailblazers, playing an active role in defining future standards and building workflows that will eventually benefit the whole industry. Others are specialising in their own focus areas, and creating new downstream experiences, or new methods of connecting with their partners using digital assets as the foundation.

But, on balance, everyone is working to an end state where a universal, unqualified level of trust can be placed in digital twins of physical products, for essentially any use case throughout the extended value chain. And when we get there, a different, deeper kind of work will begin. And it will be a different kind of fashion industry doing that work - not just one that does a better job of digital product creation, but one that has fully internalised the idea of representing itself and governing itself digitally.



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MEET THE KEY PLAYERS

FROM THE PIONEERS AND MAINSTAYS OF 3D DESIGN AND SIMULATION, TO NEW DISRUPTORS IN MATERIAL DIGITISATION AND DIGITAL FASHION, WE PROFILE THE COMPANIES THAT ARE WORKING TO BRING THE END-TO-END VISION FOR DPC TO LIFE.

In our first-ever DPC Report, in late 2022, we wrote that digital product creation had reached a tipping point, where an area of fashion technology that had long been evaluated in isolation had become a cornerstone of an entirely different way of working - one that spans the entire end-to-end horizon from initial idea to immersive downstream experience.

With the industry now increasingly aligned to that farther-reaching vision, a new scale of demand is being placed on the stack of technologies that will be required to deliver on those possibilities for end users at every stage of the extended product lifecycle.

This scope and this wide-open possibility space continues to make choosing DPC technologies and partners a complex process. Not only do brands, retailers, and manufacturers have to make the right choice in a single area (whether it's a digital materials platform or a partner for building real-time downstream experiences), they have to make it multiple times, with a long-term view towards taking advantage of both the capabilities of individual solutions, and the compounded benefits of integration and interoperability.

Choosing to embrace digital product creation is not just a matter of selecting a 3D design and simulation tool, but building an entire DPC pipeline, and re-orienting multiple components of your business around it. And building that pipeline, and the processes to go with it, is perhaps one of the most defining series of choices that any brand will make over the next few years.

To aid in that decision-making process, the next section of this report contains detailed information about some of the different technology vendors and service providers who are currently shaping the DPC landscape, and who elected to support this report and help keep it free to read.

For each of them, we asked the questions that we believe matter the most when brands like yours are looking to discover, shortlist, and work with new partners. So each vendor contained in this section was asked to provide:

- An overview of their solution
- A list of their headline customers
- An indication of their monthly active users
- A breakdown of their pricing model
- A laundry list of their technology partnerships and integrations

We also spent time with a senior executive from each company to better understand their ethos, their strategy, their roadmap, and how they believe the digital product creation ecosystem and community for footwear, apparel, and accessories will evolve in the near future.

Every vendor has also provided a point of contact, so if you see a solution or service you think could enrich your DPC strategy, even more information is just a click away.

Please note that the information contained in the vendor profiles that follow this page remains the property of the vendors themselves - each of whom is a paying sponsor of this report. While we endeavour to check the data we are given, The Interline does not verify the authenticity of customer engagements, user figures, or technology partnerships, and the contents of any advertisements provided to us are solely created by the advertiser.

To find out more about a particular technology vendor or service provider, you can jump straight to their listing and executive interview using the links below.

While it can be tempting to start and end with the most recognisable names in 3D, we encourage you to explore the full suite of vendors contained in these pages, as well as conducting additional research through The Interline and other sources. You may be surprised by what they are capable of, and what synergies there are to be discovered in their partnerships, which could provide ways to unlock new use cases and new capabilities from your digital tools and assets.

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BROWZWEAR
CENTRIC SOFTWARE
CLO VIRTUAL FASHION
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SEDDI
STYLE3D
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Founded: 2019

PRICING MODEL:

ShimmerScan Cloud requires a Starter Package - from USD$149 (one-off fee)

Additional Scanning Credits can be added as needed (usage-based / based on volume)

Serviced scanning is charged per fabric. Discounts are available for high volumes.

Bandicoot is offering a complete cloud-based solution for creating digital fabric twins that are accurate and faithful to the physical fabric.

Patented technology allows for fast, automatic generation of high-quality PBR textures and seamless tiling, turning a series of regular image files into a complete 3D-ready digital fabric for use in popular 3D design tools such as CLO3D, Browzwear, Adobe Substance, Optitex, and more.

Easily digitise your own fabrics with equipment you already have. Purchase the complete onboarding package on Bandicoot's website to create digital fabrics of the highest quality, without the need for expensive dedicated hardware and time spent on manual tuning.

Offering one of the most user friendly and accurate approaches to fabric digitisation, Bandicoot is now one of the fastest growing solutions for brands, independent designers, manufacturers, and fabric mills to create digital fabrics.

Bandicoot offers two approaches to fabric digitisation:

- ShimmerScan Cloud – an easy-to-use method that enables anyone, anywhere to create accurate digital fabrics with off-the-shelf camera equipment.
- Serviced scanning – we take care of everything for you. Simply send your fabrics to us (or one of our global partners), we digitise them, and share the digital fabrics in our web app – ready for use in a wide range of 3D workflows.

HEADLINE CUSTOMERS:

Archroma - Bru Textiles - Bureau 555 - Cone Denim - Hugo Boss - Levi's - Li & Fung - NEXT - Northern Playground - R.M. Williams - Tessellation

150+ TOTAL NUMBER OF ACTIVE USERS WORLDWIDE, ACROSS THE FOLLOWING REGIONS:

25% NORTH AMERICA **35%** EMEA

5% LATAM **35%** APAC

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Founded: 2019

10+ TECHNOLOGY PARTNERSHIPS, INCLUDING:

SWATCHBOOK (2020) - BROWZWEAR (2021) - VIRTUAL TOUCH (2021) - OPTITEX (2022) - JEANOLOGIA (2023) - CLO3D (2023)

Our PBR texture files are fully compatible with all popular 3D CADs, like CLO3D, Browzwear, Optitex, Adobe Substance, Maya, and 3Ds Max, and also popular game engines incl. Unreal Engine and Unity.

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

Bandicoot is on a mission to make it as easy as possible to create high-quality digital fabrics, and we see that as an ongoing role and responsibility.

With a team of world-class scientists and deep industry knowledge, Bandicoot is positioned perfectly for leading major technological advancement, fully centred around our customers' direct pain points.

Fabric digitisation needs to be accurate. accessible, available, affordable, and scalable. We're not going to get through the next phase of DPC with expensive dedicated hardware and complicated software.

Bandicoot's role in the Digital Product Creation journey is to innovate and move the industry forward with surprising technologies and approaches, that just makes sense
when you try them for the first time.

We openly invite anyone to compare the quality and scalability of Bandicoot's digital fabric solution to any other alternative on the market. See it for yourself. Get in touch today.

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JØRGEN SEVILD

CHIEF GROWTH OFFICER, BANDICOOT IMAGING

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

The greatest short-term opportunities through investment in DPC will centre around enhancing the speed and agility of bringing products to market while reducing physical prototyping costs. To achieve this, I believe it's important for technology companies to form stronger partnerships across the ecosystem. Many of us serve the same customers, and it makes sense for us to work together to create better digital workflows for the end user.

In the next year, I also believe we will see new opportunities as we learn to navigate the increasing pressure from government regulations mandating traceability and transparency in supply chains. DPC isn't just a tool for innovation; it's becoming a necessary framework for compliance and ethical governance in fashion.

For fashion to truly achieve the ambitions it has for digital product creation, it will need to be easy and affordable for brands and their partners to be able to accurately digitise fabrics - because digital materials will be the foundations for basically everything the industry wants to build on top of 3D. How is Bandicoot's approach to unlocking that foundation different from the way other technology and service companies are tackling the same challenge?

Bandicoot's approach to digitising fabrics is rooted in simplicity and accessibility - we're creating an end-to-end solution that 'just works', at large scale for an industry with strict quality requirements.

At a high level, fabric digitisation technology is now divided into two camps: direct capture and approximation. Direct capture is the established approach, and the team behind Bandicoot has created new science that now actually makes this approach easy, affordable and scalable. It's critical to first focus on creating digital materials that are scientifically accurate and true to their physical counterparts, and then make it easy, affordable and scalable. It doesn't matter that you get something fast and cheap if what you get is unfit for its purpose.

Key players in the industry are recognising that Bandicoot has unlocked something fundamentally new, and many are already using our solution to realise measurable benefits that were simply not possible before. We've simplified the process, making use of ubiquitous photography equipment to produce high-quality, faithful digital twins, sidestepping the need for expensive and complex machinery and training. It's Bandicoot's goal to lead by example, pushing the industry towards a future where 3D is built upon reliable and trustworthy material digitisation.

What is it going to mean for the industry to really scale fabric digitisation? Is it fair to say that industrialising and rolling out material capture capabilities to the supply chain has stalled, and if so, what is it about Bandicoot's method that makes it better-positioned to embed genuine scale and broad adoption into the value chain?

Eventually, fabric digitisation at scale means that every physical fabric on the market will have a digital twin. In order to achieve this, we need the technology to be affordable, easy to use, and available where and when it's needed. In order to scale true and accurate fabric digitisation, the technology must be relatively hardware agnostic, operate on a cloud-infrastructure, integrate seamlessly with other relevant tools to form flexible and effective workflows, and it must be extremely easy to operate correctly.

Most alternatives on the market either miss the mark on quality or the key factors that make the tech scalable. Bandicoot is strategically positioned at the sweet spot in the middle, between no-compromise-on-quality and built-for-scale.

We're seeing the current state of the industry as more of a shift, rather than a stall. We're experiencing more widespread adoption and usage than ever before. But the roll out has shifted. It's less two-sided, between either brand or supply chain, than first anticipated. It's now more three-sided, where "Fabric-Digitisation-as-a-Service" is becoming more relevant, because there is more expertise to DPC than just knowing how to use the technology.

A key advantage of Bandicoot's solution is that it's so easy to build a global network of serviced digitisation hubs with it. We have already been working with customers to build out several digitisation hubs spread around the world, simultaneously, fully operational within a week.





The economic climate right now is introducing some uncertainty around the investment required to deliver on strategic goals for DPC, where the return on that investment is going to come from, and how soon. What's your perspective on how and where 3D / DPC strategies can deliver the most meaningful value? And what does it say about the industry's long-term belief in DPC that Bandicoot itself was able to close a million-dollar funding round, from investors who have a lot of first-hand experience of the fashion and textile industry, during this kind of downturn?

DPC is transforming how fashion companies operate. It's improving how we develop products and market them, and in time, it will enable entirely new business models. This shift to a quicker, more responsive model is not just about immediate returns; it's about staying relevant and maintaining competitiveness in the market.

Our recent funding round isn't just a financial win; it validates Bandicoot's value to customers, partners, and the industry as a whole. It's been a challenging environment to raise funding in, but we are fortunate to have the support from visionary investors who recognise the company's unique value proposition and market potential. In addition, Bandicoot's new investors are all from within the textiles industry, and they bring decades of industry knowledge and networks. To me, that summarises everything that needs to be said about the industry's long-term belief in Bandicoot's pioneering scientific achievements, and the value of 3D and DPC.

This is your second interview for our DPC Reports, so let's talk about what's changed since we last spoke, in late 2022. Bandicoot has been pursuing that high-volume digitisation capability we've already talked about, but what other developments have you made at the material level, and in the global scanning network you're building?

Since our last update, Bandicoot has made significant leaps forward. Quality has been at the centre of our attention, and we have also rolled out some important new features. In addition to the expected PBR texture maps, we now also generate "alpha maps", necessary for digitising transparent materials. We have made significant improvements to our automatic tiling technology to ensure seamlessly tiled digital textures across a wider range of materials. Our improved "stitching" technology, which automatically stitches together overlapping scans, has been used to digitise pattern repeats up to 3 x 3 metres.

We continuously focus on improving the user experience, and we have built some very cool new technology that allows our customers to do high volume digitisation with no compromise to quality. This enables digitisation at volumes the world has never seen before. I can only mention what's already been released. We have some very exciting releases that I'm not able to go into detail on yet. The industry will see more of those soon.

We invite anyone interested in trying Bandicoot's solution to compare the results with any alternative fabric digitisation technology on the market. It's something you'll want to see with your own eyes.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

The ideal 3D / DPC pipeline is category-specific. It's complicated, but there simply is no one-size-fits-all. A bit ironic, but I believe one of the biggest barriers preventing us from moving forward is the continued search for a generalised pipeline and this mindset. Other important barriers include a lack of skilled people in the right roles, lack of universal standards and formats, and varying degrees of technological adoption across the supply chain. To build pipelines primed for widespread adoption, the industry needs a concerted push towards common frameworks and strong leadership.

My simple version of fashion's full-scale DPC vision is when 3D/DPC is so normal and integrated that we evolve out of talking about it the way we do now - as this new, floating technology, separate from the core business. In the future, we will look back wondering how on earth we used to do this business without it.



BANDICOOT
IMAGING SCIENCES

browzwear

WWW.BROWZWEAR.COM

Founded: 1999

PRICING MODEL:

Browzwear's priority is to ensure customers have the right solution to fit their needs from start to finish, therefore our team works closely with customers, providing expert support and guidance throughout the onboarding process. For enterprise pricing, please contact our team directly.

Design students, freelancers, fashion enthusiasts and entrepreneurs looking to discover Browzwear's 3D apparel design software can apply for the company's Indie Program which enables them to start their digital apparel journey with a limited, sponsored VStitcher license and on-demand learning.

A trusted partner of more than 1,000 fashion and apparel companies worldwide, Browzwear unlocks digital craftsmanship, allowing the creative act to flow across the entire value chain. Advanced 3D visualization is the foundation for software and services that make it possible to design, produce, and sell with remarkable efficiency. Virtual prototypes are true to life. Sampling and production are streamlined. Ideas come to market faster, with cost and waste reduced at every step of the way. The result is nothing less than the digital transformation of the entire fashion industry.

The 5 Pillars from Sketch to Store

From strategic planning to innovative design, meticulous fitting, effective selling, and streamlined manufacturing, Browzwear's 3D solutions transform the creative process. Explore the seamless journey from concept to clothing, meticulously crafted and brought to life through the power of 3D.

Plan - Apparel brands and manufacturers can optimize their planning processes by adopting digital tools and data-driven decision-making. This results in streamlined operations, increased efficiency, and improved profitability.

Design - Our cutting-edge solutions empower fashion brands and designers to optimize their design processes, streamline collaboration, and unleash their creative potential. The result – best-selling garments that resonate with your target market.

Fit - With our 3D clothing design software, VStitcher, apparel brands and manufacturers can optimize their fit processes, streamline collaboration, and deliver impeccably fitting garments across all sizes.

Sell - Our advanced solutions empower fashion brands and retailers to optimize their selling processes, leveraging 3D digital catalogs, showrooms, and customization capabilities to revolutionize their approach.

Manufacture - Our tools harness the power of 3D to provide a comprehensive view of garment design, grading, and fabric consumption. Such insights enable businesses to make informed decisions, optimize their cost structure, minimize waste, and ultimately enhance profitability.

HEADLINE CUSTOMERS:

Dickies - Kohl's - Nike - Otto International - PUMA - PVH Corp. - Target - Under Armour - VF Corporation - Walmart

browzwear

WWW.BROWZWEAR.COM

Founded: 1999

100+ TECHNOLOGY PARTNERSHIPS, INCLUDING:

Alvanon - Archroma GmbH - Avery Dennison - Bemis - BeProduct - BeyondXR - Centric Software - Chaos Group - GRAFIS - Hark - Jeanologia - JML Apparel - Lalaland - Metail - Pointcarre - PTC - Sketchfab - Substance by Adobe - The LYCRA Company - Trapdoor Creative - Tronog - Vizoo - VNTANA - YKK

Browzwear unlocks digital craftsmanship, allowing the creative act to flow across the entire value chain. We align and accelerate digital workflows, from sketch to store, as a trusted partner of 1000+ Customers, 150+ Schools, and 100+ Technology partners.

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

Browzwear is proud to be an innovative leader in the digital apparel revolution. Our pioneering 3D solutions for apparel design, development, and merchandising are the key to a successful digital product lifecycle. Through the power of beautiful, true-to-life 3D, designers, developers, production, and marketing can now collaborate effectively to get creative products to market faster than ever before.

At Browzwear, we are committed to the following pillars of transformation:

Rewriting the Rules - From end to end, we are opening up new lines of thought and ways of working for an industry defined by change.

Digital Craftsmanship - Through 3D design, sampling, and fabric recreations, we are expediting the diffusion of a high-end craftsmanship mentality to digital technology.

Strategic Innovation - Not technology for technology's sake. We help companies to set and achieve ambitious sustainability goals.

From Sketch to Store - We transform workflows by facilitating the efficient creation of true-to-life 3D visualizations that can be shared and deployed throughout the value chain.

As a purpose-driven solution that removes the barriers to 3D, Browzwear impacts the bottom line—and much more. We help partners to set and achieve ambitious sustainability goals. We can also unlock new capabilities for the measurement and tracking of impact across value chains.

CONTACT

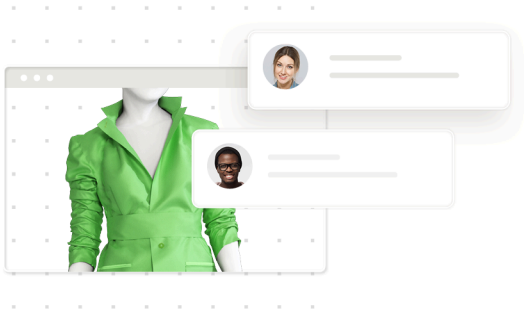
browzwear

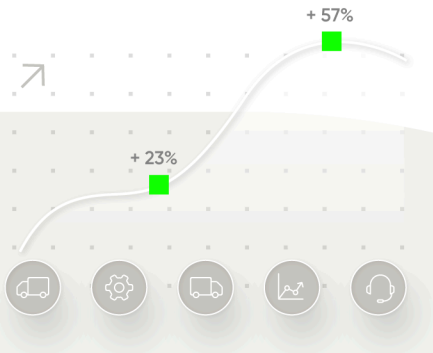
Connected by Creation

Breaking down barriers between digital and physical, the virtual and the actual.



As the fashion industry continues to undergo a digital transformation, it is not just the garments that are getting a new look. As workflows become digital, the way in which teams work together changes as well.





From silos to workflows, Browzwear does more than bring people together over shared assets. We bridge gaps to enhance collaboration between and among teams. The results—organization, simplification, and, ultimately, integration across the value chain—expediting processes and aligning decision-making.

Talk to Our Team Today to Find Out More

Contact Us

A trusted partner of more than 1,000 fashion and apparel companies worldwide, Browzwear unlocks digital craftsmanship, allowing the creative act to flow across the entire value chain.

PUMA · OTTO · adlo · Walmart · target · NIKE · VF · KOHL'S · UNDER ARMOUR



GUY SHALEV

VICE PRESIDENT OF PRODUCT MANAGEMENT, BROWZWEAR

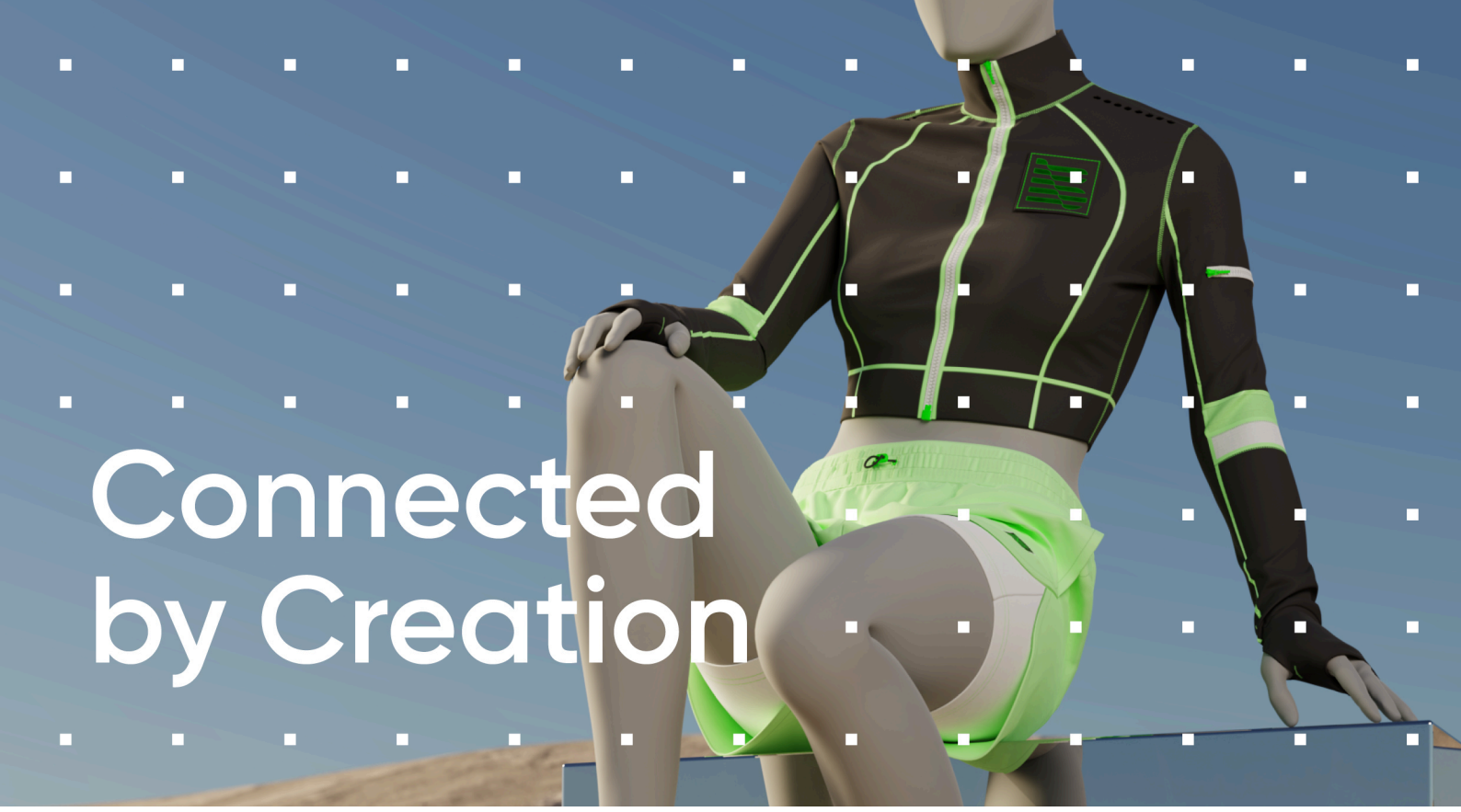
What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

DPC is transitioning from being a nice-to-have feature to a must-have, presenting a tremendous opportunity for improvement in garment creation workflows. With the right tools in place, decision-makers will for the first time, be able to measure and witness how DPC enables them to move quickly and efficiently. As we envision it, 2024 should mark a complete shift towards adopting DPC to measurably alter the profit line.

A lot of DPC strategies have focused on very granular use cases, achieving real results but in very narrow lanes. One of the biggest industry-wide challenges is now bringing those different lanes together into more enterprise-wide transformation. What role do you believe technology vendors have played in contributing to that focused mentality, and how do you see that changing in the future?

In DPC and across the dynamic fashion tech sector as a whole, the prevailing trend has been to address customers' pains by crafting innovative new tools and solutions. While some of these solutions are genuinely inspiring in their own rights, the majority share common characteristics.





Connected by Creation

They are often designed with a specific persona in mind, whether it be a pattern maker, merchandiser, or another role. Many of them employ proprietary, non-open file formats, and their usefulness as collaboration and communication tools relies on third-party applications or manual workflows—often in the form of email.

While operating in that manner - constructing solutions to address customer pains - proves effective in certain cases, it has also resulted in a very siloed way of working, and made us ignore the most overlooked entity in the DPC space: the workflow.

The workflow should be a single entity that crosses borders, relevant for different customers from different geographies, and that that all personas of the organisation contribute to.

At Browzwear, we have invested a lot of time into mapping, analysing, and visualizing the different workflows that exist within the 3D / DPC process, and we have collected the top pain points from a diverse range of our customers. During this process, we realized that every fashion business has a unique flavor and approach to their garment creation workflows. Emerging trends such as supply chain agility and 'make-to-trend', are ushering in new rules and considerations.

We also identified that decision-makers - the roles that need oversight of collections - do not typically have the level of X-Ray visibility they need to conduct comprehensive workflow analysis.

This realization mirrors my experience as the manager of Microsoft's Innovation Lab in Israel, and it leads to a humbling realization: that there must be a clear drive for everyone to better understand and enhance those workflows, instead of just creating new solutions for them and inundating the market.

So, our major focus at Browzwear today is to help our customers build end-to-end agility by giving them adaptable solutions that can transform their workflows - not just their standalone processes.

And how do you believe brand and retail businesses should be shifting their thinking to make the same move from isolated applications of 3D / DPC and into wider transformation?

The biggest piece of advice is to strive to unearth the root cause of challenges and pain points, instead of just addressing the symptoms. If your time to market is longer than you would like, focus on *why* the bottlenecks and delays exist, instead of just looking for *where* they occur.

And it is important to bear in mind that the same pain point may not manifest itself in the same way for different users, or different departments and personas within your organisation. What seems like a silver bullet solution for one set of people might not address the needs of another - even if their work directly feeds into one another's.

When you are speaking to the people who create technology solutions - providers like Browzwear

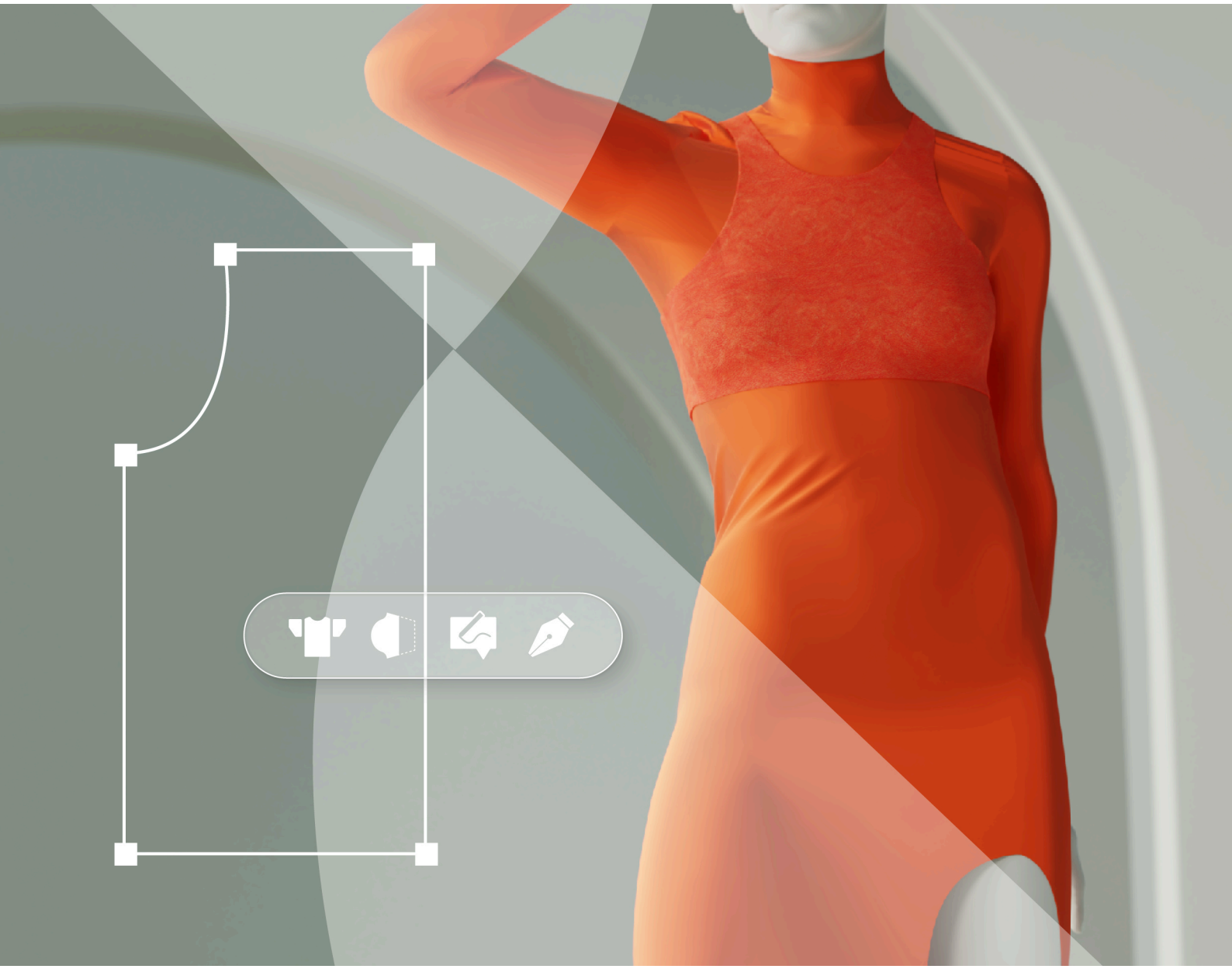
and others - you should feel confident to ask them specific, focused questions that go beyond the ideal use cases they demonstrate, and that are applicable to your real-world needs.

Above all, ensure you are thinking about your DPC strategy as an opportunity to build and strengthen your end-to-end workflow. Too often that goes overlooked during transformation projects, but it really is the key to success.

Thinking about that wider transformation task, under the Browzwear umbrella you have everything from direct material capture to collection building. How do you approach building out and offering a suite of products that easily combines to help organisations to digitally transform their entire business?

We understand that a successful digital transformation is heavily depends on adoption, and that adoption will only happen is we provide tools that:

- Bring value to all stakeholders, not just to garment manipulation experts. This ensures that decision-makers and senior managers are included for the first time.
- Are simple to use by everyone, with or without technical skills. Whether it's AI or a high-end UI, the end experience should be super simple.
- Are frictionless, they take advantage (not replace) of what the organization already has in terms of process and software and help them utilize it.



When it comes to realising a return on investment from digital product creation, that whole-business angle is especially important. How do you see DPC in general - and Browzwear's solutions specifically - helping customers to achieve value in speed, cost, sustainability and other strategic objectives?

We believe that the industry's understanding of the benefits of using DPCs has evolved significantly. While initially, we viewed it as an opportunity to reduce the need for physical samples, we now recognize how DPC is impacting every step of the end-to-end garment journey. For the first time, we can pinpoint where and how much.

For example, we can demonstrate how customers adopting DPC and utilizing our tools can shorten timelines, identify and remove blockers more quickly, and, above all, gain not only a true-to-life 3D model but also a genuine understanding of their current workflow. DPC is enabling organizations to become more efficient and profitable.

Lastly, consider sustainability. Similar to our approach with AI, we are not inclined to follow the obvious path. Sustainability, for us, is not just a buzzword. We believe that working with the right materials is indeed important, but reducing waste is even more crucial. Surprisingly or not, the path to achieving this goes through the process of improving the workflow.

How would you describe the ideal 3D / DPC pipeline – category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

We humbly think that the ideal pipeline is different for each company, and we are not trying to force existing workflows. However, we do believe that the industry is lacking tools that will allow organizations to measure the impact of 3D on their actual sales. It seems as if 3D models require a supportive software environment that will enable them to be widely used in the organization—an environment that brings new '3D consumers' to the table who are not there yet. DPC will be widely adopted when we, as an industry, have the tools to measure and prove that we are really moving the needle.



CentricSoftware®

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Founded: 2003

PRICING MODEL:

Centric solutions are subscription-based.

Centric Software® provides a unique, seamless, concept to customer product solution experience to drive go-to-market innovation and value creation for fashion and consumer goods retailers, brands and manufacturers.

Centric Software's flexible, scalable, user-friendly solutions optimize planning, pricing, design, product development, sourcing, production, sales, allocation and replenishment, including:

- Centric PLM™ - streamline and accelerate product development and launch to save time, boost productivity and reduce costs with the number one PLM in consumer goods.
- Centric Planning™ - best-in-class, easy-to-use and visually-driven financial, merchandise and product portfolio planning as well as store and vendor forecasting for seamless and fast pre- and in-season execution.
- Centric Visual Boards™ - a suite of visual pivot tables that combine data with 2D and/or 3D images and can be integrated to any enterprise solution to transform team collaboration and decision-making.
- Centric Pricing & Inventory™ - AI-powered predictive pricing and stock optimization tools to comprehensively optimize merchandise management and pricing across the product lifecycle.
- Centric Market Intelligence™ - make better decisions with AI-driven competitive product price assortment benchmarking, e-commerce analytics, unique consumer trend insights and a 360-degree view of the market.

Centric Software has the highest user adoption rate, customer satisfaction rate and fastest time to value in the industry. Centric Software has received multiple industry awards and recognition appears regularly in world-leading analyst reports and research. Centric is proud to provide the best solution, backed by the best team to service the best customers.

HEADLINE CUSTOMERS:

Allbirds - AlphaTauri - Arc'teryx - ARMEDANGELS - ASICS - Benetton - Bestseller - BIRKENSTOCK - Burton - C&A Brazil - Callaway - Carhartt - Carter's - Cotopaxi - Crocs - Decathlon - Desigual - ECCO - Ellassay - Esprit - Everlane - Fenix - Frank And Oak - Gant - Grupo Kyly - Guess - Helsport - Helly Hansen - Hirdaramani - KappAhl - Keen Footwear - Kering - Balenciaga - Kering (Saint Laurent) - Longchamp - Louis Vuitton - LVMH (Celine) - LVMH (Dior,) - LVMH (Kenzo) - Mango - Marc Jacobs - MAS Holdings - Mint Velvet - Mizuno - Mugler Fashion - Mulberry - Neiman Marcus - Pangaia - Peacebird - Pearl Izumi - PVH - Replay - Rothy's - s.Oliver - Skechers - Swarovski - The Gap Inc. Titleist - Under Armour - Volcom - Wolverine - Yargici - Zadig & Voltaire

USERS WORLDWIDE, SPLIT ACROSS THE FOLLOWING REGIONS:

30% NORTH AMERICA **3%** LATAM **44%** EMEA **23%** APAC

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Founded: 2003

15+ TECHNOLOGY PARTNERSHIPS, INCLUDING:

3D Experience Platform - Adobe - Alvanon - Browzwear - Clo3D - Fairly Made - Green Score Capital - Microsoft - Optitex - Solidworks - Swatchbook - Rhino - Visual Retailing - Vizoo3D - Worldly/Higg

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

Centric Software recognized the potential of DPC for soft and hard goods at an early stage and continues to develop innovations that enable designing, developing and sourcing with PLM as the central hub for digital assets. With the addition of Planning, Pricing & Inventory and Market Intelligence to its portfolio, Centric has expanded the use of 3D assets across multiple teams like merchandisers, pricing, inventory, buying and more.

Our strategy remains 3D software-agnostic, adding connections with commonly-used 3D design platforms like Rhino 3D, Alvanon, CLO3D, Browzwear, Optitex and SOLIDWORKS as well as 3D material technology such as Vizoo and swatchbook.

Centric's market-driven innovations, along with 3D integration, enable teams to work directly with 3D from the PLM interface whether they are involved in design or not. User feedback on digital samples stays within Centric's single source of truth platform, which is critical to product development and data management. Our customers use digital assets for a wide variety of applications outside of product development and sampling, including consultation with clients and retailers, virtual showrooms for internal buying, e-commerce, marketing and brand storytelling.

We work very closely with customers who are pursuing exciting and innovative DPC strategies. S.OLIVER GROUP, who implemented Centric PLM for 900 users in just 4 months, has been able to discard the costly and time-consuming process of creating physical samples and its associated manual work, shipping and customs costs and photo shoots with 3D+PLM. Arc'teryx are using 3D to reduce sampling in order to meet their sustainability goals and to speed timelines. They are also leveraging the avatar library in Centric PLM for easier visual searching as avatars are their true starting point for DPC.

With Centric solutions at the center of a digital ecosystem, we enable brands, retailers and manufacturers to scale digital product creation workflows at an enterprise level. This enables them to achieve goals ranging from boosting product innovation to being more sustainable, reducing costs and achieving faster time-to-market.

CONTACT

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PLM | PLANNING | PRICING & INVENTORY | MARKET INTELLIGENCE | VISUAL BOARDS

Seamless Digital Product Creation Workflow from Concept to Customer

- 3D agnostic
- 100% Go live rate
- Used by 800+ consumer goods retailers, brands and manufacturers



Plan, design, develop, source, buy, make, price, allocate, sell, replenish with Centric solutions

SCAN ME

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SAURABH DESHPANDE

VICE PRESIDENT, PM & UX DESIGN, CENTRIC SOFTWARE

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

Retailers, brands and manufacturers of both soft and hard goods are facing increasing market challenges, and DPC opportunities must align with what consumer goods companies need to do to overcome those challenges. Economic conditions, from inflation to interest rates, are squeezing margins and increasing competition for shrinking consumer wallets. Add to this fickle consumer behavior, geopolitical unrest and disruptions due to weather and natural disasters, and you have a daunting picture.

The greatest opportunities for investment in DPC are the same as the top-of-mind concerns for brands. DPC has a role to play in:

- Getting closer to consumers, which involves delivering consumer-centric products and assortments that will reduce inventory and improve sales and margins.
- Streamlining operations by improving internal and external collaboration to be more efficient, speed time to market, enhance sustainability and ensure compliance with regulations.
- Improving margins through interventions at every point in the product lifecycle, from more cost-effective collaboration with suppliers, to reducing waste, to cutting out resource-heavy tasks.

AI and machine learning are fantastic tools that are already improving overall business performance. AI/ML will also be the key drivers for enhancing enterprise tools like DPC solutions, especially in terms of realistic texturing and material simulation. Closer integration between 3D design and product development tools, PLM solutions and 3D material scanners will speed time to market and help businesses deliver products consumers want.

The major opportunities in 2023/24 are in investing in technology that can fully bring the promises of DPC to fruition. We've spoken about benefits such as reduced sampling and faster time to market for a long time - and these benefits have been delivered to a degree. However, fast-moving developments in DPC, particularly in 3D materials, will make it possible to develop those benefits further.

There are exciting possibilities on the design concept side. Interdisciplinary talent will merge artistic creativity with technical expertise using tools like text to 3D, for instance. AI-rendered

product imagery will bridge the gap for slower adopters of DPC, bringing them closer to a correct visual representation of the product. Developments in virtual try-ons and how close we can get to a realistic representation of fit will be very important in terms of returns mitigation and e-commerce in general.

A lot of 3D initiatives have, for a long time, focused on the vision for virtual sampling - cutting out one or more rounds of physical samples by replacing that iterative process with decision-making based on digital samples instead. How far have we come to actually realising that vision today, and what have been the key unlocks along the way, based on your experience with Centric's customers and the way they use your solutions?

When considering investment in DPC, brands first need to take note that DPC is resource-hungry and generates large amounts of data. Powerful hardware, efficient digital asset management and cloud hosting is critical for scalable 3D design. Finding the right talent can be a challenge as well.

Several customers that we work with have successfully invested in and created a DPC workflow and are already realizing that vision, with some saving weeks worth of time in creating samples. While physical samples certainly still have a place for most customers, particularly towards the end of the sampling process, digital sampling is streamlining and shortening the earlier phases of sampling. Our customers report that digital samples are enabling them to cut sampling rounds, do fewer revisions, achieve shorter lead times and streamline collaboration with factory partners.

Customers are using DPC to overlay new materials and colorization on carryover styles to save time and resources. This makes it easier to shorten timelines with factory partners who already have access to the original product data and 3D files. Some have taken a hybrid approach to reduce sales samples, building styles from the ground up with 3D, generating virtual samples, then perhaps carrying only one through to physical sampling and commercialization while using 3D to represent alternative colorways and materials to buyers or even consumers.

Beyond sampling, technology has a major role to play in enabling brands to create products with targets in mind - whether that means designing for environmental impact, or designing to cost. But that's something that hinges on close integration between 3D / DPC tools and the environments where critical product data resides and where creative and commercial choices are made. How do you see Centric's solutions supporting that drive to empower designers to support strategic objectives?



Designers can only support strategic objectives if they have access to information about those goals and can see exactly how their design choices impact business targets. We've always developed solutions with connectedness and visibility in mind. Design and product development teams working with Centric PLM™ can sandbox ideas and run detailed what-if scenarios to see exactly how design and material choices affect strategic objectives, pulling in real-time data from multiple enterprise systems to assess the effect on costs, sustainability goals and more. Visualization of data is really important for teams that work in a visual medium, so these teams can also use Centric Visual Boards™ to represent data and make collaborative decisions.

We've worked in close collaboration with customers to integrate the 3D / DPC tools that they actually use every day with Centric PLM, including popular software such as Browzwear, CLO, Rhino, Optitex, SOLIDWORKS, Vizoo and swatchbook. By doing this, Centric PLM isn't just the source of critical product data that designers bring from outside the system - it becomes the hub where 3D design can happen and design decisions are made, informed by that data. It is the one single source of truth that keeps all teams on the same page so that they can ensure business objectives are met.

Thinking further than design and development, one of the major themes of this report is the huge array of different use cases that exist for digital assets today. From downstream eCommerce to internal sales and marketing, how is Centric helping to deliver on that broader ambition for what's possible with digital representations of physical products?

Democratizing the utility of 3D is a key focus in our digital-first strategy. 3D is a big investment for companies, and it makes sense to get the broadest return possible by facilitating the use of digital assets across the organization. Our customers use digital assets for a wide variety of applications outside of product development and sampling, including collaboration with suppliers, buying sessions with wholesalers and store managers, e-commerce, marketing and brand storytelling.

E-commerce is a particularly valuable application of 3D, enabling consumers to view and rotate realistic product imagery. Digital assets are even being tested in virtual try-on apps that project an image of clothing or footwear onto your body in realistic space and at scale. Photogrammetry, which takes hundreds of photos around a product to generate a 3D model of that product, is also coming into its own as a foundation for creating online stores and virtual showrooms for internal buying.

And naturally, 3D technology offers a range of opportunities when it comes to personalization, transforming the way products are designed, manufactured, and experienced by consumers.

All of this is only possible if digital assets can be easily shared and accessed across different enterprise systems and different teams, rather than being confined to the 3D design team.

Whether we're thinking about technology integration, file interoperability, or cultural change, there's a lot to consider for any brand, retailer, or supply chain partner who's looking to make 3D a deeper part of the product development process. What are the most common challenges, and what guidance and best practices have you found to help ease that transition?

As stated earlier, the investment needed in hardware and talent is a challenge.
3D requires a very specific skillset that can be hard for retailers and brands to find and afford.

Another challenge is the closed loop information strategy employed by some 3D vendors that can create friction during the development process. 3D requires material data and pattern-making skills that are trapped in the supply chain. The suppliers own the BOM and materials details. There isn't an easy answer here, but perhaps we'll see a shift towards in-house production of 3D assets.

Generative AI is set to disrupt the use of 3D for line visualization. Technologies similar to Midjourney are already being deployed by brands to replace 3D creation with prompt engineering. However, there is a steep technology ramp up to train private data sets using public tools.

Change management is one of the biggest challenges, of course, and any time you have significant change, there will be pushback. Proper training and investment in tools that genuinely make a difference to the everyday work lives of teams will go a long way to persuade people of the advantages of DPC. Without adequate hardware, teams will experience frustration dealing with



huge, heavy 3D files. The reality is that some of the technology is still halfway there, and overcoming resistance will take time, investment and belief. Pilot projects and a phased implementation strategy that aligns with the company's needs and objectives are preferable to diving in head first.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

The ideal DPC pipeline is agile, scalable and suitable for specific design and development sprints. It's also a vision that supports business objectives and is therefore connected to the rest of the business. We see PLM as the central focus for collaborative development of 3D assets, and their deployment throughout the business ecosystem for other purposes such as e-commerce and marketing.

New DPC technology has to use standardized formats, make 3D easier to author, make material information easier to capture, and make 3D light enough to be used across teams. Decimation tools can greatly reduce file sizes, but brands need to be certain that the associated loss of fidelity won't have a major impact on decision-making.

Brands need to have a clear vision that justifies investment, and a detailed roadmap for adopting DPC. They also need to ensure that their DPC vision is connected to the rest of the business through foundational enterprise systems like PLM and Planning in order to deliver the best results. For fashion to fully take advantage of the benefits of DPC, the whole ecosystem needs to continue to evolve in a way that delivers real value to adopters of DPC technology.

CLO Virtual Fashion

WWW.CLO3D.COM

Founded: 2009

PRICING MODEL:

We offer pricing for different tiers. Further information can be found on clo3d.com or on style.clo-set.com

CLO Virtual Fashion's mission is to empower every step of the garment journey, from concept to design, manufacturing to marketing, and fitting to styling. With more than 20 years of research and development in accurate garment simulation, CLO is leading the market by digitally creating, merging, and converging all aspects related to digital garments through our state-of-the-art 3D cloth simulation algorithm.

CLO's ecosystem of products and solutions include: 3D garment design software, digital asset management systems and a collaborative design platform. In addition, we offer consumer-facing solutions such as e-commerce virtual fittings. With our latest release, CLO 7.3, designers can create garments faster, easier, and more accurately than ever before, as well as creating hyper-realistic garments ready for application in entertainment, games and the metaverse.

CLO has also launched several new initiatives to push the fashion industry forward, including virtual try-on services and showrooms, a Metaverse Converting Service, and a Web3-powered digital fashion marketplace. We are confident that our technology will power the future of everything related to garments, and we're excited to build it together with our user community.

HEADLINE CUSTOMERS:

Arc'teryx - Bershka - Bestseller - Desigual - Gap Inc., IB Company - L.L. Bean - Lojas Renner - Mango New Balance - s.Oliver - Salewa - Target - URBN

*[Our comprehensive list of clients can be found **here**.]*

CLO is used by more than 1 million users globally (including individual designers, fashion brands, and schools) in more than 100 countries.

CLO Virtual Fashion

WWW.CLO3D.COM

Founded: 2009

25+ TECHNOLOGY PARTNERSHIPS, INCLUDING:

Adobe - Alvanon - Epic Games - GoVise Technologies - Lectra - Meshcapade - NVIDIA - Pantone - PixelPool - SwatchOn - YKK

*[Our comprehensive list of partners can be found **here**.]*

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

CLO's technology is trusted by a wide range of industry leaders for its realistic simulations of fabrics, draping and garment movement. With CLO, designers and brands can take advantage of reduced time and cost associated with traditional sample-making processes, all while unleashing their creativity with ease, which can accelerate the product development process and improve the overall quality of their designs.

CLO has the potential to be a game-changer for many across the entire Digital Product Creation pipeline – including, but not limited to, designers, manufacturers, as well as marketers. For example, designers can create digital twins to physical samples to enable virtual fit sessions, online merchandising assortments, internal sales reviews, digital photoshoots and even marketing campaigns, to name just a few applications - all while collecting data points and metadata to generate analytics and tech packs. CLO's offerings have helped entire organisations to collaborate more efficiently and effectively by speaking the same (3D) language.

We believe that our technology can play a key role in reaching a sustainable, waste-free fashion future where digital assets replace physical samples and 3D-based collaboration improves communication between designers and manufacturers, and other consumer-focused innovations are the norm – such as "responsive design" where consumers can purchase designs before they're even produced and 3D virtual try-ons which can minimise returns and exchanges.

CONTACT

Computer-Aided Design
Software

CLO

Cloud Content Collaboration
Platform

CLO-SET

Intuitive Fashion Design
Software

JINNY

Online Community
Platform

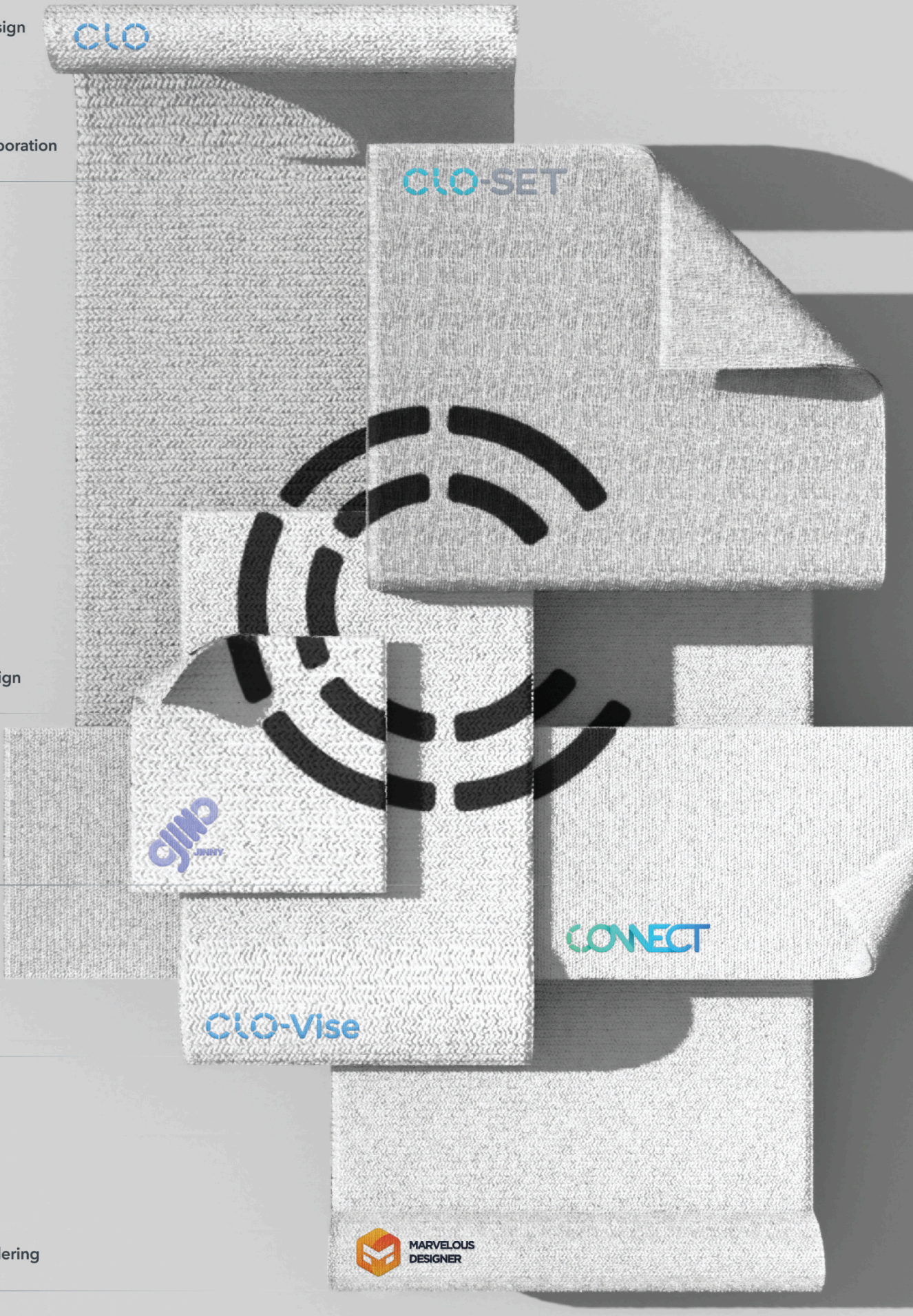
CONNECT

PLM Integration
Software

CLO-VISE

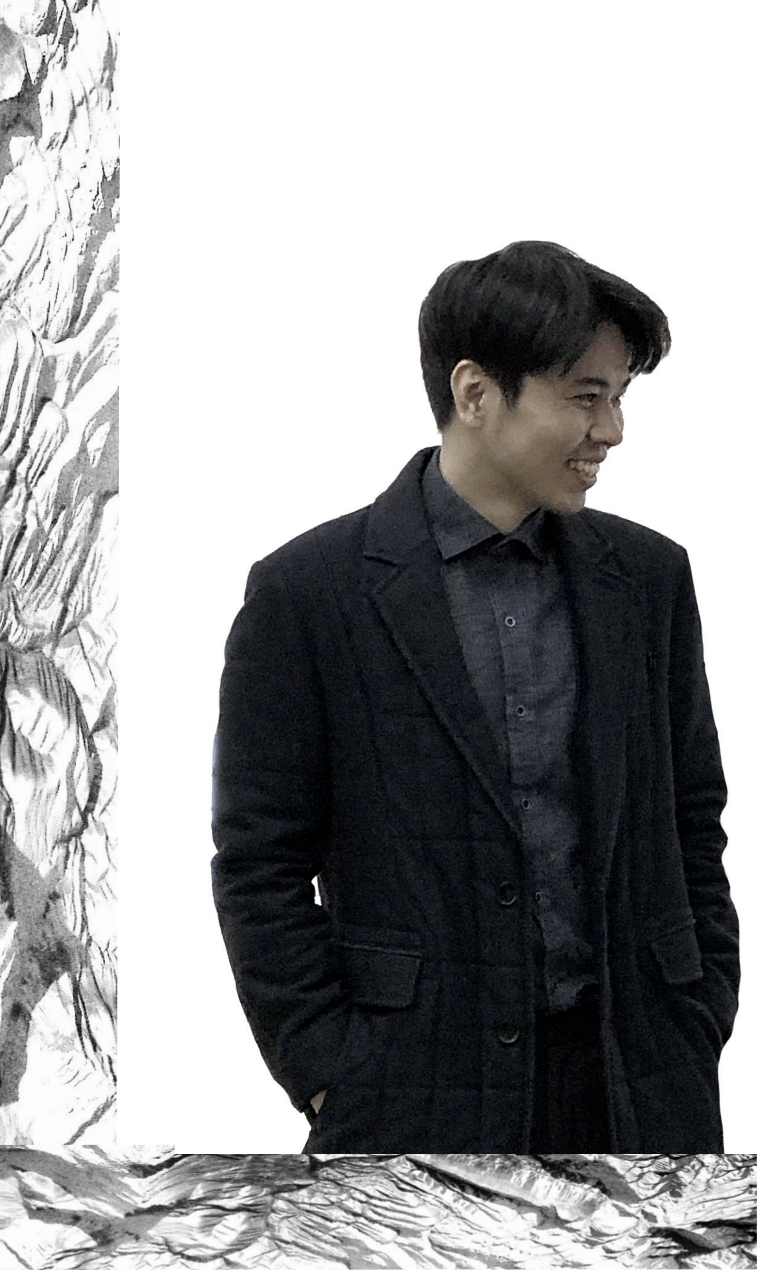
3D Modeling & Rendering
Software

MARVELOUS DESIGNER



CLO

Evolved from the word "clothing," CLO's mission is "to empower everything related to garments" from design, to styling and beyond.
Unlock the potential of virtual fashion. Learn more at clo3d.com



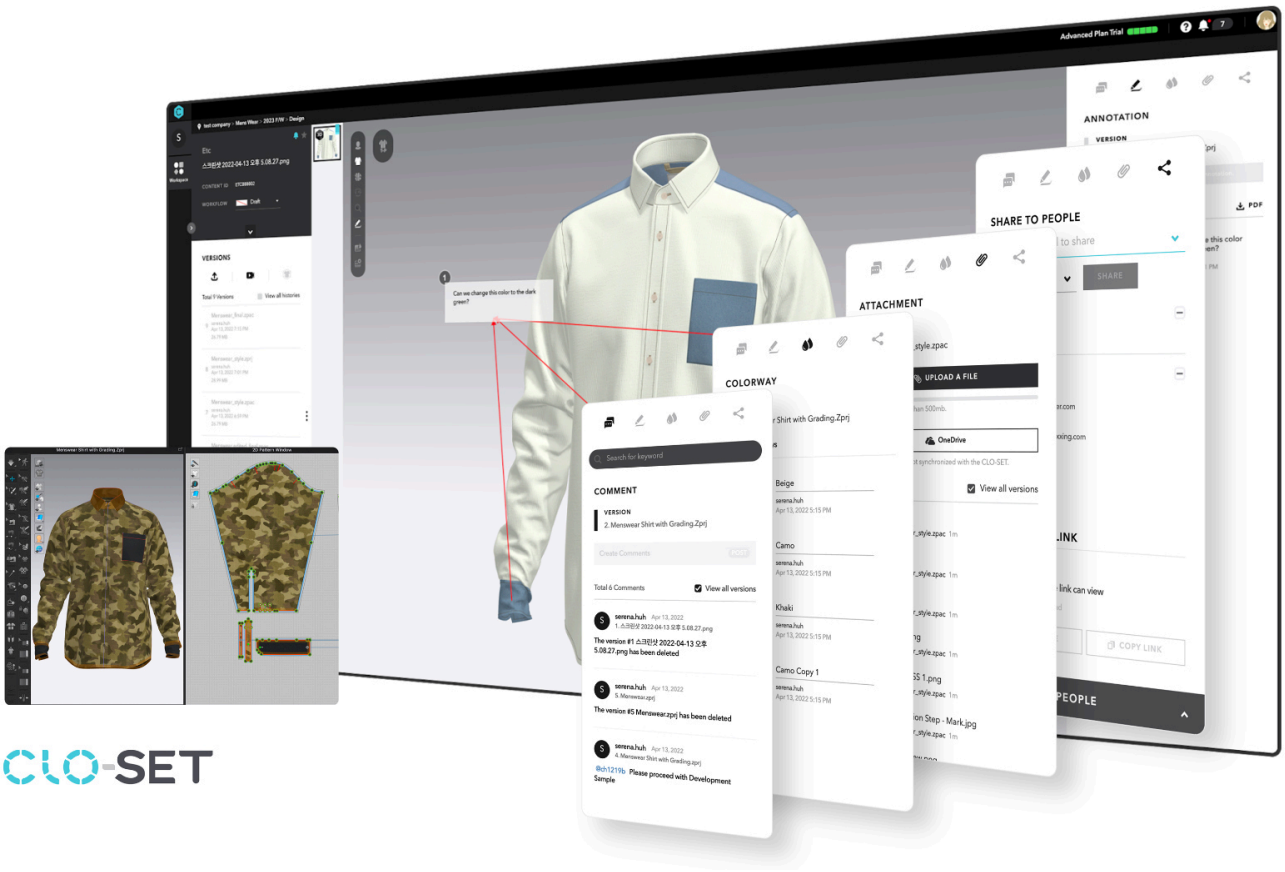
JADEN OH

FOUNDER, CLO VIRTUAL FASHION

A key part of integrating 3D and digital product creation into real workflows - complete lifecycles that need to bring together not just designers and developers, but merchandisers, sourcing teams, sales and marketing and more - is creating a place for those 3D assets to live, to be found, and to be shared and developed by cross-functional brand teams. Tell us how you're approaching that with CLO-SET, and why it differs from the integrated 3D / PLM approach a lot of brands are taking to this problem today.

We developed CLO-SET with our clients' practical workflows in mind. For many years, we had heard from them the need for a better and easier way for people in the product creation pipeline to collaborate with one another. 3D files act like a common language, in a way. Once a file is created and uploaded, CLO-SET can automatically analyze the data, and provides practitioners a set of documents and tools to easily communicate and share feedback. Work created by designers and developers are reviewed using the "3D Viewer," while merchandisers, sales, and sourcing teams utilize tools like "LineSheet", "TechPack" and "BOM" as part of their workflows. Marketing teams have the ability to work with features like "Showroom" and "Virtual Fitting" for their responsibilities. The centralization of data also means that changes are automatically reflected across all documents and tools. As such, people don't need to manage and update documents repetitively - a huge time saver for many. What we've observed is that processes which used to take several days to complete, can be significantly shortened, with the adoption of CLO-SET. And real-time communication becomes possible among team members.



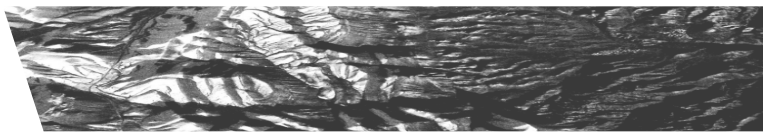


That centralisation is also likely to be a big factor in unlocking the ability for 3D / DPC to bring brands and their supply chain partners closer together. How do you think about CLO-SET, and 3D in general, as the future engine for that kind of value chain collaboration?

It's something that excites us a lot. If implemented well, it has the potential to create a lot of efficiencies and increase velocity. Product development cycles are no longer held up by FedEx package delivery disruptions, or people waiting for emails with large attachments and screenshots to arrive. By leveraging baked-in features such as "3D Viewer," "Annotation," "Comment," "Configurator," "TechPack," and "Linesheet," teams and designs can move seamlessly forward without interruptions. Another advantage lies in the data that is created and accumulated; when fabrics and trims are uploaded to CLO-SET and used to create garments, every raw material is automatically linked and stored within the 3D garment file. Brands can immediately track which vendor or supplier provided the raw materials, making BOM management and sourcing more convenient. Conversely, suppliers can easily market their materials and offer them to brands. As the data layer gets denser, more applications are possible for everyone involved in the product development environment.

Earlier in this report, we wrote about the "end state" for digital product creation being the ability for anyone to trust a 3D asset enough to make a creative, commercial, or buying decision based on it. How close to do you believe we are to that point? And what's your perspective on using 3D renders to showcase products to consumer and wholesale buyers - and even to test those markets with digital assets as part of the product development cycle?

In recent years, we've seen 3D technology surpassing the level of merely replacing actual product photos for decision-making purposes. Thanks to advanced simulation and rendering techniques, captivating product images can be generated at a much lower cost and larger volumes. Virtual try-on technology is also getting better & becoming more commonplace, which is helping with confidence levels among users and customers. I think it's already enabling brands and producers to become more efficient with volume predictions.



What do you believe is next for the 3D design community? The latest release of CLO has an emphasis on helping to support their creativity through new capabilities like AI texture generation and fabric creation. What do you think it means to create software that empowers designers in 2023/24?

Our goal has always been to develop features to help our users in their practical workflow. So even before things like AI texture generation and fabric creation, we created automation functions like auto grading, auto sewing, auto arrangement, styleline design tools to simplify and help designers work faster and more efficiently. My opinion is that recent advancements in AI technology has resulted in a lot of 2D-based images and video innovations. We aim to take the lead in practical improvements in 3D garment and trim generation.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

As mentioned earlier, data centralization can enable significant value creation. The key to successful implementation, I believe, is how efficiently it connects 3D contents with a server. We've witnessed the automotive, architectural, and industrial design segments achieving a high degree of innovation through 3D SW-based PLM. The challenge for the fashion industry is that we're faced with developing a much larger volume of content in shorter time frames. On top of that, connections between DPC software and PLM are often not as efficient as they could be. I think it comes down to how well we can develop a user experience that seamlessly connects SW and contents with the server, enabling natural data centralization during the design and development process. CLO will embrace that challenge.



DMIx

www.dmix.info

Founded: 2015

PRICING MODEL:

DMIx delivers flexible module based solutions, providing a scalable and cost-effective platform that ensures a positive ROI for businesses ranging from 2 to 2000+ users.

DMIx is a comprehensive platform developed by ColorDigital GmbH to redefine the way brands, suppliers, and manufacturers handle color management, product creation and production processes. We are more than just a platform; we are your strategic partner in the journey towards flawless results and efficient processes. By fostering a seamless flow of information and ensuring real-time connectivity across all stakeholders, we empower brands, suppliers, and manufacturers to operate in perfect harmony.

Precision in Color: We address and solve color-related quality issues, ensuring that what you design is what you get efficiently in retail results. No more costly claims or discrepancies.

Efficient 3D Workflow: We've transformed the product creation process. Our standardized, scalable, and 3D-based workflow brings suppliers into the fold, maximizing efficiency. The result? E-commerce ready content that's consistent and high-quality.

Seamless Data Connectivity: Our platform connects and exchanges product and material data across all tiers. Thanks to our unique real-time technology, collaboration becomes intuitive and instantaneous ready to feed your PLM.

Integration Ready: DMIx isn't just another isolated solution. Our platform is designed for easy implementation and high security. Whether you're using ERP, PLM or creative and production tools, DMIx integrates seamlessly, making the transition smooth and worry-free.

Discover how DMIx can help optimize your processes and enhance collaboration, setting the benchmark for your company like we already do for major players in Europe, Asia and the US.

HEADLINE CUSTOMERS:

Amann Group - Hugo Boss - Mammut

Marzotto - PVH - Südwolle - Valentino

10,000

ACTIVE USERS WORLDWIDE, ACROSS APPROXIMATELY 500 ACTIVE ACCOUNTS.

DMIx

www.dmix.info

Founded: 2015

15+ TECHNOLOGY PARTNERSHIPS, INCLUDING:

Adobe Creative Suite - Adobe Substance - Browzwear - Chaos - CLO - Datacolor EIZO - iCAD 3D - gITF - Pantone - Penelope - RAL - verce - Vizoo - X-Rite

[DMIx offers full API connectivity to various PLM/ERP systems.]

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

DMIx stands as a pivotal player in the Digital Product Creation (DPC) landscape, seamlessly bridging the digital and physical realms through our innovative phygital approach applying digital twin technology. As the industry shifts towards large-scale industrialization and embraces a world filled with limitless possibilities, our platform ensures precision, efficiency, and cutting-edge innovation at every stage of product development.

Our unique phygital strategy integrates the tactile reality of physical samples with the agility and versatility of digital workflows, providing a comprehensive solution that caters to the intricate needs of brands, suppliers, and manufacturers alike. This harmonious blend ensures that the richness of real-world color and texture is accurately represented in the digital space, facilitating a more immersive and reliable product creation process.

As DPC continues to scale and evolve, DMIx's adaptability and robust framework stand out, supporting businesses of all sizes in their journey towards excellence and innovation. Our platform encourages a real-time exchange of precise product information and color data, fostering a collaborative ecosystem that propels the entire industry forward.

Embracing the vast opportunities of this digital era, DMIx is committed to shaping the future of product creation, ensuring that our partners are well-equipped to navigate the challenges and seize the opportunities of this transformative time. Through our phygital approach, we are not just participants in the DPC journey; we are architects, helping to build a future where digital precision and physical reality converge to create unparalleled product experiences.

CONTACT

DMIx

The Phygital Ecosystem

www.dmix.info

Connect with Our Textile Engineering Experts: Discover the Potential for Your Business!!



Full control on color & bulk quality. No more claims.

Transparency & Data exchange with your tier chain.

DPC standardization & scalability across tiers.

Full Connectivity with PLM / CAD / 3D

SECURE & PRECISE INTERACTION
ISO 27001 CERTIFIED
*** SINCE 2015 ***



GERD WILLSCHÜTZ

COO / Co-Founder, ColorDigital GmbH

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

In 2023/24, the greatest opportunity to invest in digital product creation (DPC) is the initiation of a transformative journey. Investing in DPC talent and integrated solutions like DMIx is not just about enhancing capabilities; it's about pioneering a shift in the paradigm of product creation.

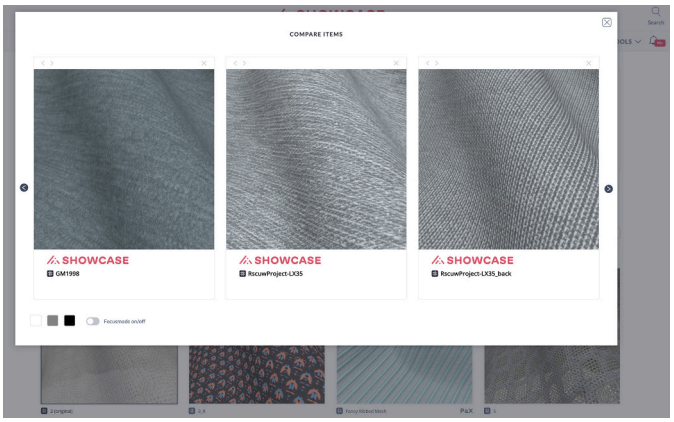
The focus on DPC talent is crucial. We're envisioning a workforce that goes beyond using tools to reimagining the entire process of design and development. This new breed of talent will drive innovation, making processes more flexible and responsive to the ever-evolving digital landscape.

In terms of tools, the most immediate and impactful benefit lies in accurate color communication. With technologies like DMIx, we can address one of the fashion and textile industry's most persistent challenges: color discrepancies. This isn't just about aesthetic precision, but about operational efficiency and sustainability. Accurate color communication means fewer reworks, reduced waste, and improved customer satisfaction.

By investing in DPC, we're not just making an operational decision, but also a strategic move towards a future that values efficiency, sustainability, and customer-focus. This is about initiating a transformation, learning continuously, and harnessing the low-hanging fruits like precise color communication to set the stage for a more innovative, efficient, and responsive industry.

Do you believe that fashion is focusing too heavily on scaling digital product creation without having the right standards in place? And if so, what would the right foundations for interoperability and data interchange actually look like when they're put into practice?

In the quest to scale digital product creation (DPC) in fashion, the industry does risk putting the cart before the horse. Scaling without a robust framework of standards is like building a skyscraper on sand. It might rise quickly, but it's vulnerable to collapse. DMIx recognizes this, and it's at the core of our approach: scaling with standards.



Compare different materials straight in the DMIx 3D library



DMIx Studio render of lace material and digital human.

The right foundations for interoperability and data interchange in DPC are not just about technical compatibility, but about creating a common language. In practice, this looks like a unified platform where data flows seamlessly across different systems, software, and stages of the supply chain. It's about an ecosystem where all players, regardless of size or technological capacity, can interact without barriers.

DMIx is crafted to be this universal translator in the world of fashion DPC. By avoiding the trap of being tethered to a single technical provider, we mitigate the risk of creating isolated technological islands that can't communicate with one another. Our vision is to encompass all tiers, ensuring that from the smallest supplier to the largest retailer, everyone speaks the same digital language.

So, the foundation we need is one of inclusivity and universality. It's a foundation that doesn't just allow for data interchange but encourages it. It's a system where interoperability is a given, not an afterthought. This is what DMIx is building, and it's how we believe the industry can scale digital product creation not just rapidly, but sustainably and resiliently.

When we talk about the DPC ecosystem, we're obviously speaking about core 3D simulation tools, rendering engines, and digital material platforms, but we're also bringing in big, firmly-established enterprise systems like ERP and PLM, as well an array of other software and hardware across the extended supply chain. How do you think about your ambition at DMIx to be the connecting, digital thread that brings those environments together?

When we consider the digital product creation (DPC) ecosystem, we see a rich tapestry of technology – from 3D simulation tools to enterprise systems like ERP and PLM. At DMIx, our ambition is to be the digital thread that weaves these diverse elements into a cohesive, functional whole. Our goal is not simply integration; it's interaction.

We recognize that the strength of a digital ecosystem lies not merely in its individual components, but in how seamlessly and effectively they interact internally and with other applications. DMIx already operates as a 'phygital' ecosystem, skilfully bridging the physical and digital realms. We connect a vast array of software and technical devices, from digitalization tools to quality control systems, creating a harmonious and efficient workflow.



DMIx Studio render of fabric.

Our extensive API plays a pivotal role in this. It's not just a conduit for data exchange; it's a catalyst for innovation and development. By linking relevant assets and initiating processes, we enable a level of collaboration and efficiency that's unprecedented in the fashion and textile industry.

Think of DMIx as the conductor of an orchestra, where each instrument is a different software or hardware component. Alone, each instrument has potential, but together, under the guidance of a skilled conductor, they create something magnificent. That's our vision at DMIx – to harmonize the DPC ecosystem, ensuring that every element, from the smallest software to the largest enterprise system, contributes to a symphony of digital innovation.

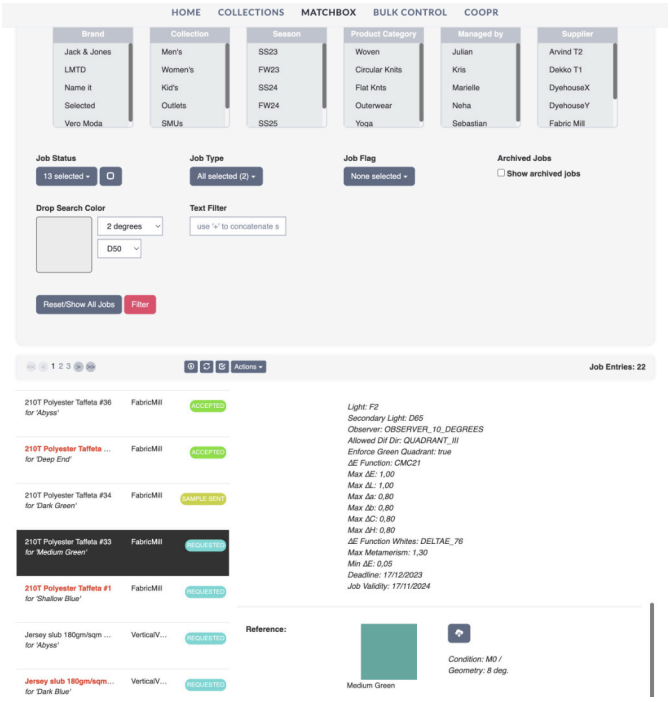
Our ambition is bold, but it's grounded in a deep understanding of the industry's needs. We're not just building a platform; we're crafting an environment where creativity, efficiency, and technology converge to redefine what's possible in digital product creation.

As well as geometry and materials, the main continuous thread that runs through digital product creation is colour. Even in the analogue world, though, colour accuracy and integrity pose significant challenges, and discrepancies between intent and final colour are a significant risk and also the root cause of a huge amount of unnecessary sampling and waste. How do you propose to solve this, digitally?

In the journey of digital product creation, color generally is the starting point, the first brushstroke in a masterpiece. In the traditional world, achieving true color accuracy has been a maze-like challenge, leading to a cascade of inefficiencies and discrepancies. But at DMIx, we're not just addressing this workflow challenge; we're taking a new course that leads directly to the consumer, transforming their experience and improving retail quality.

DMIx revolutionizes this process by transitioning from a subjective, creative color vision to an objective, globally recognized industry standard. This standardization is more than a technical feat; it's a universal language bridging the gap between designers and manufacturers, ensuring that what's imagined is exactly what's produced.

This alignment between creative vision and production reality has a direct and profound impact on retail quality. Consumers receive products that match their expectations – the color they see is the color they get. This precision in color representation not only boosts consumer satisfaction but also significantly reduces costly color-related claims. The result is a tangible, proven return on investment (ROI) for businesses. Every color selection is a promise kept to the consumer, where the beauty of carefully staged products is matched by true to original design. This is the world DMIx is building – a world where digital accuracy leads to real-world satisfaction!



DMIx MatchBox - Management system for color development

For a lot of brands and their partners, digital product creation strategies are focused on enabling the entire value chain to become more responsive - reacting quicker to changing market demands, and trimming the timeline from idea to finished product - but there's a deeper opportunity for the industry to use the same tools and assets to become proactive instead, moving ahead of consumer demand. How does DMIx support that kind of dynamic, real-time model?

In the world of digital product creation, many brands are focused on being responsive and adapting quickly to market demands. But at DMIx, we're not just keeping pace with the market; we're creating a setup that enables to be more dynamic, more agile. It's not about reacting to trends; it's about enabling a level of flexibility and speed that can redefine the industry standards.

At the core of our DMIx philosophy is bringing the right people together. We create an ecosystem where transparency is paramount. This clarity across the tier chain is transformative and illuminates every step of the product creation process.

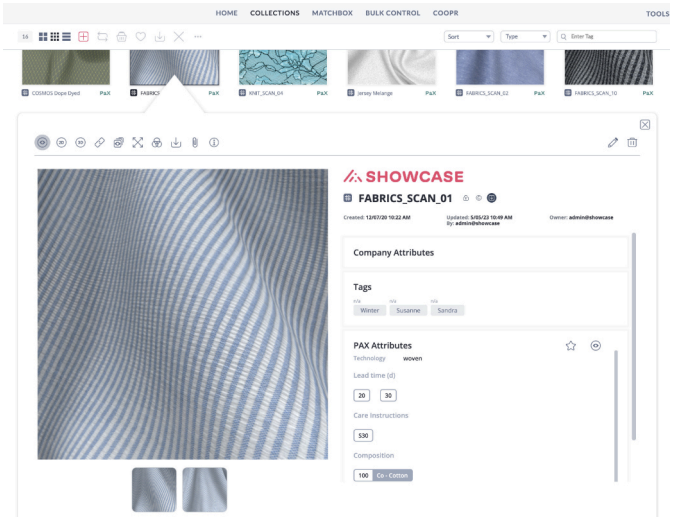
The DMIx project management systems, DMIx CoopR and DMIx MatchBox, are not just tools, but catalysts for change. They transform traditional, disjointed workflows, which are often confined to personal email inboxes, into standardized, efficient, and collaborative processes. This is where the magic happens – where ideas are nurtured and developed with precision and speed.

By integrating the suppliers' product master data systems with the brands' PLM/ERP systems, we not only connect the dots, but also construct the basis for a digital product passport. This infrastructure is key because it prepares brands for future shifts, such as eco-tax regulations. It's a proactive stance that ensures compliance and readiness for upcoming changes in the industry .

While DMIx might not directly influence consumer preferences, it opens windows for greater flexibility and faster development without compromising on quality. With DMIx we're creating a world where brands not only react to the market, but where they are able to navigate it with agility and insight.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

Each brand, each category has its unique rhythm, and yet there's a universal melody that unites them all. The ideal pipeline, therefore, should be adaptable – flexible enough to cater to specific needs, yet based in standardization and scalability. This is where the true artistry of digital product creation lies.



Detail view on fabric incl. texture download and master-data.

Currently, the obstacles to realizing this vision are not only technological, but also cultural. We encounter a landscape where proven industrial workflows are often overlooked, and harmonized processes are absent even within a single company. This disjointed approach is akin to musicians playing in different keys – there's potential, but the lack of unison leads to dissonance.

The key to unlocking the full-scale vision of DPC lies in a change in mindset. Decision-making, especially for standard items, needs to embrace the digital realm. This isn't just about introducing new tools, but also about redesigning processes and workflows in a digital context. As long as there's reluctance to move decision-making into the digital space, the path to an ideal DPC pipeline remains blocked.

However, it is inevitable. Ignoring the growing demand for data-driven transparency and effective workflows would not only be a missed opportunity, but also a strategic misstep, even for the industry's most successful players. The future of fashion depends on its ability to integrate digital innovation into its core processes.

Personally, I believe in a world where fashion is not just created but orchestrated through a harmonious blend of technology and creativity. At DMIx, we're committed to creating this world and turning the vision of a unified, adaptable, and standard-driven DPC pipeline into a reality.

DMIx



DMIx Studio render based on CLO garment.

WWW.HAPPYFINISH.COM

Founded: 2004

PRICING MODEL:

We offer a dynamic pricing model designed to align with the needs and objectives of our brand and retail partners.

Our collaborative approach reflects the cost of the scale of integration with existing content pipelines and teams, and the consultative, creative, or technological inputs required.

Happyfai's proposition can be tailored to the specific content packages required, ensuring a bespoke solution that fits the content strategy of each brand or retailer.

Additionally, we offer subscription-based pricing for ongoing content needs, providing a cost-effective solution for consistent, high-volume content creation.

At Happy Finish, we craft digital twins of physical products, people and spaces. From the most exquisitely rendered campaign key-visuals to high quality CG e-com content delivered at scale, we are fanatical about connecting brands with their audiences.

With happyfai we have developed a tailored, sustainable and transformative solution for high-quality 3D content production that significantly outperforms conventional (both CGI and Photography) workflows.

Happyfai leverages dpc, human-centric creativity, real-time engines and AI to empower brands and retailers with significantly more sustainable, impactful, brand consistent, and cost-effective content production.

In a market where 65% of brands are struggling with the complexities of traditional content production workflows, happyfai enables any retailer, brand or organisation with an already established dpc pipeline (or in the process of developing one) to generate pre-defined, creatively configured, automated content packages at scale.

Our engagement process often begins with a comprehensive workshop that brings together key stakeholders to map out current content pipelines and identify priority product lines and the most significant pain points.

From there, we craft tailored happyfai configurations that combine CG asset creation and ingestion, the definition of creative guidelines, as well as the integration with offering databases and the plm techstack.

E-commerce is projected to grow significantly, doubling in the US alone from $993.1 billion in 2022 to $1.9 trillion by 2030. The global visualisation and 3D rendering software market is set to total $6.3 billion in 2026, up from $2.9 billion in 2022.

This expansion is amplifying demand for sustainable, diverse, and creative content across a growing number of new and existing channels.

Happyfai provides a key building block by helping partner brands and retailers serve-up superior content packages sustainably and at scale across all touchpoints.

HEADLINE CUSTOMERS:

Balmain - Calvin Klein - Dolce & Gabbana - GHD - Marks & Spencer - Mattel - Nike - Restoration Hardware - Tommy Hilfiger

WWW.HAPPYFINISH.COM

Founded: 2004

10+ TECHNOLOGY PARTNERSHIPS, INCLUDING:

8thwall - Epic Unreal Engine (since 2015) - Epic Mega Grant recipient for visual merchandising 2021 - Lightship - Microsoft Mixed Reality (Partner since 2017) - Microsoft Mesh (Partner Programme 2023) - Meta Reality Lab (Project Partner) - Niantic - TikTok - Unity

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

In the rapidly evolving landscape of Digital Product Creation (DPC), Happy Finish stands at the forefront, offering transformative content solutions for brands and retailers. Our expertise in crafting tailored digital product twin pipelines, for sell-in and sell-through, positions us uniquely to support the DPC journey, particularly as it scales and diversifies.

Happyfai enables the creation at scale of high-fidelity 3D content that seamlessly integrates with existing digital-twin pipelines. By leveraging the power of human-centric creativity, real-time Engines, and AI, Happyfai provides a pathway for brands to realise the full potential of digital twins. This approach not only enhances the speed and quality of content creation upstream and downstream, but also helps build a more sustainable asset life cycle.

Happyfai pipelines address common challenges in traditional content production workflows, which 65% of brands struggle with, by offering a solution that produces high-quality, omni-channel content at an unprecedented scale and speed. Our automated workflows expedite content creation by an average of 45% compared to traditional CG pipelines, delivering a significant reduction in time to market.

The benefits of greater virtualisation in asset production are clear: reduction of physical sampling needs, faster decision-making, a considerable reduction in cost, consistency across the ever-expanding channel-mix, and enriched storytelling capabilities. Particularly in fashion and apparel, where we foresee digital twinning becoming a standard practice within the next few years, Happyfai offers a competitive edge that helps realise the full potential of DPC.

Our engagement often begins with comprehensive workshops to understand and integrate into our clients' existing DPC processes. We then tailor solutions to fit specific needs, combining CG asset creation, creative guideline integration, and PLM techstack alignment. This end-to-end approach ensures that deployment prioritises the greatest value-drivers across different product lines.

In summary, Happy Finish is a strategic partner in the DPC journey, enabling brands to harness the power of digital twins for sustainable, impactful, and scalable content creation upstream and downstream.

Let's make DPC assets work harder, together!

CONTACT



more, better, faster, **for less?**

happyfai, a state-of-the-art tech solution from Happy Finish blends human creativity, real-time engines, and AI to empower **brands** and **retailers** to produce high-quality, engaging product content on an unprecedented scale.

happyfai offers personalised, brand-aligned content creation that surpasses customer expectations across all marketing channels, all at a significantly reduced unit cost.

HAPPYFAI
SUSTAINABLE PRODUCT CONTENT ENGINE SOLUTION

- State-of-the-art Real-Time render + AI-driven solution.
- Addressing needs fast at an unprecedented scale.
- Bespoke, brand-consistent product content.
- Drive the sustainability agenda.
- Reduce content production cost.

GET IN TOUCH

info@happyfinish.com
happyfinish.com

CREATIVE TECH PRODUCTION AGENCY
London | Portland | Milano | Verona

OUR PARTNERS

EPIC GAMES · UNREAL ENGINE · Microsoft HoloLens · Meta

MIRKO SCOLARI
CEO, HAPPYFINISH



What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

In our view, the investment in DPC talent and future-ready tools in 2023/24 can have a significant positive impact on areas of strategic importance for brands, such as sustainability, speed to market, digital ecosystem development, and purchasing journeys for sell-in and sell-through.

As DPC and CG workflows evolve, tools like Nvidia's Omniverse or Epic Unreal Engine are paving the way for much needed greater interoperability among proprietary platforms, tools and applications.

In our experience this is absolutely critical for ensuring that digital assets can be utilised more seamlessly and beyond walled-garden ecosystems. In the end this will help scale the digital asset lifecycle, make it more efficient and future-ready, as well as open up much wider talent pools.

In light of the importance that fashion brands, big and small, are placing on digital product creation, what does it mean, to you, to be strategic technology and service partner at such a pivotal point in the industry's adoption of 3D / DPC?

Being a strategic technology and service partner comes with a unique blend of opportunity and responsibility. At this point in the DPC and CG (r)evolution, our role increasingly transcends service provision alone, and we act as a critical friend to our partner brands, a key influencer who helps inform and shape decision-making. It's a tremendous opportunity to help define and establish best practices. As a strategic partner, there's a great responsibility to help brands align their digital asset lifecycle strategies with consumer expectations.

One significant challenge we often find in the adoption of DPC is a tendency towards siloed thinking within brands, particularly regarding the use of 3D assets. As a partner, there's an opportunity for us to recognise and address this challenge. By facilitating cross-departmental collaboration, we help brands see the full potential of 3D assets beyond their immediate or departmental use case. This approach not only optimises the investment in DPC but also enhances the overall effectiveness and impact of the brand's marketing and communication (marcoms) strategies and helps deliver against ambitious goals towards net zero.

We can act as a playmaker, bridging the gap between marketing, communications, and DPC functions. This role involves not just technical assistance but strategic consultancy, helping brands to fund and extract the most value from their digital product creation investments. The goal is always to create a cohesive strategy where DPC becomes an integral part of the brand's DNA, influencing everything from product design to customer engagement.

In essence, being a strategic partner at this pivotal point means being both a visionary and a pragmatist. It's about seeing the potential of DPC and CG in revolutionising the fashion industry and being adept at translating this potential into tangible, effective solutions for each unique brand.

For a lot of fashion organisations, building and scaling content creation pipelines, and managing the lifecycles of digital assets, have not traditionally been core competencies, which is why you've found that more than 60% of brands are facing challenges in this area. But we're now at a juncture where these are quickly become essential capabilities. How large is the gap, in your experience, between fashion's ambitions for digital twins and actual maturity? And what's your approach to bridging it through technology and cultural change?

In our experience, the gap between the fashion industry's aspirations for digital twins and its actual maturity in managing digital content and asset lifecycles is significant, especially in some established brands. This disparity is not just a matter of adopting new technologies; it's about a fundamental shift in approach and mindset.

Incumbent fashion brands have traditionally excelled in the art of crafting unique, high-quality products, akin to haute couture. However, scaling content creation pipelines is more akin to ready-to-wear - it's about producing high volumes consistently and efficiently. This requires a different set of skills and processes, and many brands are finding themselves in unfamiliar territory.

Addressing this gap requires more than just new tools; it necessitates a cultural and organisational shift. Many older, established brands are structured in a way that impedes innovation. In contrast, smaller, more agile players are quicker to adopt new technologies and workflows, gaining competitive advantages.

As per the famous Tolstoy quote where "All happy families are alike; and each unhappy family is unhappy in its own way" we work very closely with brands to understand their unique challenges and strengths. We tailor solutions not just to technological needs, but to organisational structures and cultures.

For example, digital product creation (DPC) teams often operate separately from e-commerce and marketing divisions. This lack of integration leads to inefficiencies and missed opportunities. The challenge is not just in adopting new technology but in fostering end-to-end thinking across internal silos. The key is a holistic, interdepartmental approach that allows for digital asset portability, accelerating lead times from design through marketing and ultimately to the consumer.

Is the best content creation and asset management / use pipeline one that borrows best practices and tools from other sectors as well as industry-specific solutions and uses them to create a common platform for fashion, or one that's highly tailored for each individual brand?

In our experience, the optimal approach involves a balanced blend of cross-sector best practices, such as much more digitally matured industries like Automotive, Architectural - BIM - and of course gaming and industry-specific solutions.

As mentioned above, interoperability is crucial here. By embracing open standards and a broader, more open approach, brands benefit in several ways. Firstly, it fosters innovation by allowing new ideas and techniques to flow freely across different sectors and from brand to brand. Secondly, it contributes to the development of a larger talent pool.

On the other hand, opting for a single, proprietary platform can be limiting in the long run. Such platforms might not evolve quickly enough to keep pace with technological advancements or changing industry needs. Furthermore, they often lock brands into a specific way of working, which can stifle creativity and innovation.





In our view, the goal should be to craft solutions that are specific to each brand's requirements, using a mix of the best practices available.

For us, the most effective content creation pipelines in fashion are those that are built on the principles of interoperability and flexibility, incorporating best practices and innovation from across the board. This approach allows for the crafting of solutions that are both innovative and tailored to the specific needs of each brand.

One of the biggest bottlenecks to scaling digital product creation is the assignment of a large workload to a small talent pool. Across industry and education, the effort to grow that talent pool is ongoing but relatively slow, which creates a strong argument for automation. What's your experience of automating content creation pipelines to break this barrier, and what benefits have you and your clients seen?

The real challenge now is to reconcile creativity with efficiency, scale, and breadth. In our experience, the evolution of DPC and CG has reached a point where the focus is shifting from churning content for various channels to the strategic configuration and automation of these asset pipelines. This transition marks a significant development in how value is perceived and generated in the industry.

We believe that the real value for brands now lies in the ability to configure and automate their CG asset and content creation pipelines, while devoting more focus on how creativity permeates throughout their entire value chain.

This shift emphasises not just the output but the process itself. Automation plays a key role here, transforming what was once a labour-intensive process into a significantly more streamlined and templatised operation.

By automating repetitive and time-consuming tasks, we can help brands optimise their use of available talent.

In our view, automating content creation pipelines is a critical step in breaking the scalability barrier in CG and DPC. It not only addresses the talent shortage but also brings substantial benefits in terms of sustainability, consistency, quality, scale, and cost.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

We believe that the ideal CG / (DPC) pipeline represents a balance between universal standards and brand-, category, and product-specific customisation. In our day to day, we come across several barriers and missing pieces that often get in the way:

1. Walled Gardens and Closed Ecosystems: Too many vendors in the DPC space still operate within closed or near closed ecosystems. This limits innovation and knowledge sharing, which are essential for the development of a more integrated and efficient DPC / CG ecosystem.

2. Short-term Thinking: There's a prevailing short-term mindset focused on immediate gains rather than long-term, strategic goals. This approach hinders the development of standardised, interoperable solutions that would greatly benefit brands and the industry in the medium to long-term.

3. Siloed Approach to Asset Lifecycle: There's a need to view digital product twins and their asset lifecycle more holistically, breaking down internal silos. DPC should be understood as the starting point of the asset lifecycle, not an end in itself, with a focus on how these assets are managed, updated, and utilised throughout their lifecycle.

In our view, creative automation is key, tailored to the specific needs of different product lines, categories, and brands. This means deploying automated content creation tools that can



KALYPSO

A ROCKWELL AUTOMATION BUSINESS

WWW.KALYPSO.COM

Founded: 2004
DPC capability added: 2012

At Kalypso, we bring digital solutions to product problems. We are the leading digital product creation (DPC) consultancy in the retail industry. Leading with a value-first, lean startup approach, we support leading brands in their digital programs at any stage of maturity.

We help rapidly accelerate and optimize DPC transformation. Our goal is to support the creation of an end-to-end solution and fully connected ecosystem to digitally create, manufacture and sell products. Our people are innovators, strategists, data scientists and technologists. We leverage their deep expertise in product creation process, organizational change management, foundational technologies such as PLM, along with knowledge of 3D technologies and experience.

SOLUTIONS WORKED WITH:

Our expertise helps clients define their needs and select or build the appropriate digital product creation tool ecosystem. Below are the types of solutions that we have helped explore or implement:

- Product Lifecycle Management
- Digital Asset Management
- 3D Modeling / Creation Solutions
- 3D Collaboration
- Material Design
- Material Libraries / Management
- Artwork & Graphics
- Rendering & Rendering Pipeline
- Visual Line Plan & Visual Assortment tools
- Virtual Store / Showroom
- Voice-of-Consumer Analytics
- Digital Fit & Analytics
- AR/VR/XR

HOW DO YOU DEFINE 'DIGITAL PRODUCT CREATION' FOR FASHION - ESPECIALLY AS IT ENTERS A PHASE OF SCALE, INDUSTRIALISATION, AND WIDE-OPEN POSSIBILITIES?

Digital Product Creation (DPC) is a revolutionary force reshaping the fashion industry, harmonizing a comprehensive technology ecosystem to streamline the entire product development journey. Operating as a digital thread linking design, production, and retail stages, DPC fosters real-time collaboration among diverse teams, promoting agility and innovation. This interconnected approach not only minimizes dependence on physical samples through virtual prototypes but also harnesses connected data for an end-to-end product development process, unlocking the potential of product lifecycle intelligence and advanced analytics. DPC accelerates decision-making processes, significantly reducing time-to-market. By embracing DPC, fashion brands navigate the industry with heightened flexibility, promptly adapting to market trends and consumer demands. This holistic approach not only amplifies efficiency but also nurtures a sustainable and consumer-centric fashion ecosystem, strategically positioning brands to thrive in the competitive market.

DPC PROCESS AREAS COVERED:

Product Operating Model
- Digital Thread Strategy & Operating Model Optimization

3D Digital Product Creation
- DPC Strategy Deployment & Scaling

PLM Solutions & Digital Asset Management
- PLM Strategy Implementation, Upgrades & Managed Services

Advanced Analytics
- Deploying High Value Predictive & Prescriptive Solutions

Sustainability, Quality & Compliance
- Sustainability & Quality Solutions & Regulatory Compliance

Product Tech Strategy & Security
- Integrated Digital Platform, Data Management & Cybersecurity

Digital Make, Inventory & Distribution
- Inventory & Asset Management, Planning & Factory 4.0 Solutions

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CUSTOMERS

At Kalypso, our clients remain confidential, but we have served over 20 major retail brands on more than 50 distinct engagements in digital product creation, across product categories including apparel, footwear, accessories and hardlines.

Full case studies are available upon request. Please reach out to Hadley.bauer@rockwellautomation.com to schedule time to walk through the approach and results of our top case studies. Our team would be happy to meet with you.

Examples of Market-Leading DPC Experience:

Global Athletic Footwear/ Apparel Brand
- DPC Strategy & Execution for Digital Footwear

Global Multi-brand Soft Goods Manufacturer
- DPC Strategy, Roadmap & DAM Implementation

Global Apparel, Footwear & Home Goods Brand
- DPC Strategy & Process Engineering

Global Multi-brand Footwear & Apparel Manufacturer
- DPC Roadmap & Business Case

Luxury Fashion House
- DPC Roadmap & Operation Model

Vertical Apparel, Footwear & Equipment Retailer
- DPC Pilot & Implementation

Global Toy Manufacturer & Entertainment Leader
- Digital Collaboration Assessment & Implementation

Department Store Retailer
- DPC Roadmap, Business Case & Implementation

STRATEGIC SERVICES:

Assessment & Education:
- Comprehensive approach with assessments, workshops, and training
- Foresight capabilities for a proprietary view of the future of product creation
- Evaluation of current capabilities and future aspirations
- Tailoring a DPC strategy aligned with business needs

Strategy & Roadmap:
- Formulation of strategy, scope, business case, and strategic roadmap
- Ensuring alignment, readiness, platform architecture, data governance, and vendor selection
- Development of a comprehensive plan for DPC program success

Operations & Organizational Change Management:
- Process redesign, program management, and stakeholder alignment
- Organization readiness and redesign
- Process and solution training, communications, and change management
- Workshops for team alignment and educational support for digital process adoption

Technology & Data:
- Crafting technology strategy, proof of concepts, and requirements definition
- Vendor selection, platform architecture, and integrations with PLM and voice of customer platforms
- Implementation of data governance and digital asset management
- Connecting the digital thread across the value chain for an efficient, collaborative digital environment tailored to workflows and sustainable transformation

CONTACT



We've never been, nor wanted to be, a typical firm.

We bring digital solutions to product problems

- Speed to market
- Increase productivity
- Reduce waste
- Improve quality
- Ensure compliance
- Increase profitability

Learn More:

KALYPSO

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ALISON CODDAIRE

SENIOR MANAGER, KALYPSO

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

The industry has had a laser focus on embedding DPC into design, tech design and ecommerce/ marketing – without shifting focus from these key functional groups, there are massive opportunities that brands can realize in the coming year by embedding DPC into merchant tasks. Capabilities like visual assortment and planning tools are emerging, and we are already seeing them gather momentum based on the success of early adopters. Enabling merchants to leverage digital samples opens the door for even more robust insights, stronger strategies, and faster assortment iterations. We are seeing clients leveraging assets to gain early consumer insights, connect digital samples to merch plans and begin to see the end-to-end benefits of a DPC transformation.

After running your digital product creation survey for several years, you changed the emphasis this time around - moving away from actually ranking maturity for the first time. What precipitated this change in 2023, and what insights did you glean?

The scale we've used in years past utilized a 1-5 maturity scale with 1 representing little to no activity, 2- developing strategy, 3- conducting proofs of concept, 4- in the process of scaling, 5- operating at scale. From 2020 to 2022, we saw a massive jump in maturity in every capability- no surprise there.

In our work with clients across the industry, we know that there is significant nuance in what scaling means within each capability and brand. In our 2024 survey, we chose to pause looking at maturity, and really zoom in on what scaling looks like across brands. We expect that the industry will remain in scaling mode in 2024 and see value in the insights gleaned from deep diving on the challenges and successes that will ultimately elevate brands to operate with DPC capabilities at scale.

In your "2022 DPC in Retail Research", the data you gathered revealed a significant amount of acceleration (in both ambition and adoption) in what you refer to as "make" and "sell" capabilities – taking digital product creation both up and downstream. Has that

blended approach persisted, or are we seeing the industry lean more heavily in one particular direction?

The industry shows strength across both areas, but brands do tend to have strength in one area or the other. Brands with advanced capabilities in creating beautiful digital sample visualizations may still be piloting digital use cases in design. It isn't rare to see a brand prioritizing one focus over the other, depending on their own strategic imperatives.

We've seen brands focused on really embedding design and digital development into product creation and development in 2023- the "make" part of the digital thread. We are also seeing this in the continued focus and advancements around material digitization. In this year's survey, respondents overwhelmingly indicated that speed to market, agility and product design were the top priorities of digital product creation. These all indicate a continued prioritization of "make" capabilities.

However, capabilities within the "sell" section of the digital thread are just as, if not more, mature for certain segments of the industry. Luxury Brands, for instance, have had huge success with a focus on selling and customer experiences that push the boundaries of the "sell" capabilities. These brands have built followings and gained valuable customer insights by focusing on how to use digital assets in virtual stores, on gaming platforms, with digital runway shows and in some Web 2.0 applications.

There is value in focusing on both ends of the spectrum, and brands are realizing their ROI based on custom strategic approaches.

As broad as the horizon is for 3D and digital product creation, no DPC strategy can be completely open-ended, and your research this year really underlined the need to set and measure return on investment – whether its incremental or transformational. How do you recommend our readers think about tracking and proving short-term value as well as keeping tabs on the vision for long-term digital transformation?

Every initiative should start with the problem the brand is solving for and use that to direct the focus. It's important to recognize where you are and want to be within the industry, using that to inform the short- and long-term priorities and approach.

Even as the horizon for a DPC transformation shifts, a brand can establish a long-term vision with clear objectives for DPC that are grounded in the strategic imperatives of a company. With a long-term view set, break the vision into achievable sprints to establish the short-term value and allow for flexibility to adjust as you test and learn with proofs of concept before moving to pilot and implementation. With technology changing and maturing, it is important to build room for innovation and adaptation in the vision-plan for reflection and monitor the priorities of the brand and industry.

Robust metrics and KPIs are useful, but don't over complicate it- focus on what is most important to the business and metrics that track user adoption and support a strong change management strategy.

Some key links are emerging right now between DPC and generative AI. How do you see the two influencing each other? And does AI have a role to play in helping fashion achieve its ambitions for speed and scale in digital product creation?

Generative AI and the very real applications within DPC can't be ignored. We are already seeing AI tools in DPC- including virtual try on, realistic avatars and material generation. AI and DPC will continue to live in an overlapping space, and machine learning offers many potential and current compliments to already existing DPC capabilities.

Software companies that serve DPC should and will continue to grow their generative capabilities to create efficiencies, speed and scale in the coming months and years. We should be seeing AI with the right inputs as an efficiency tool in digital product development and design-generating concepts, creating color runs, enhancing the realism of digital samples, and replacing repetitive tasks.

An interesting aspect of AI also lies in navigating the legality and policy that impacts data ownership and usage. This will continue to flesh out over the next year, and we expect to see rigor being established to protect the rights of creators and brands.

Brands should be monitoring how AI can serve their goals alongside DPC and the legal aspects of how AI is applied across the board. The right applications will allow their talent to focus efforts, generating bigger returns and enhancing inputs in the worlds of design and merchandising.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

DPC is an ecosystem of capabilities, and there is no one size fits all approach to a digital product creation pipeline, but the ideal pipeline fosters collaboration and speeds up decisions during "make" and enhances the customer experience in "sell". In "make", the capabilities are anchored in technology that serves all areas of the product development and adoption processes and do not isolate the digital responsibility to one area of the business. The ideal pipeline begins with materials and other libraries that enable the focus of the brand (fit, visualization, design, etc.).

The ideal DPC pipeline is centred on the needs of the business, as well. To give two often referenced goals: a brand might be focused on creating a fast/speed to market lever, and that will look different from a brand focused on a pipeline that brings assets to ecommerce. Setting strategic goals ahead of defining the DPC pipeline is an absolute imperative.

One of the things that excites me most about DPC is the door it opens to connect all kinds of data to visuals of the product and assortment, so the ideal pipeline is integrated into the enterprise data and used across the business. This unprecedented access to information requires potentially complex data management strategies- organizing this data remains a barrier to the ideal pipeline for a lot of companies.

According to our "2023 DPC in Retail Research", the biggest barriers to brands building a digital pipeline are organizational change management and a scarcity of skilled talent, two points that do go hand in hand. Successful initiatives are upskilling their people as they move them through the transformation and look to these teams to lead the change.

Looking into 2024, digital product creation can enable agility for brands that have spent the past years investing in a pipeline that solves for their unique strategic imperatives. The key in the coming year(s) will be to monitor emerging tech that fills the current white spaces and allows brands to connect the technology across different capabilities and truly deploy an end-to-end digital product creation ecosystem.

MODE MAISON

WWW.MODEMAISONLABS.COM

Founded: 2018

PRICING MODEL:

Mode Maison Platform: We sell to the Trade, honouring their trade discount.

We also sell to the End User, an entirely new addressable market, and democratize access to global luxury brands for the first time ever.

Mode Maison Labs: We sell our TMAC Ecosystem, which comprises Hardware (per machine) and Software (licensing fee).

Mode Maison is coming out of stealth… Hello World. We are an interdisciplinary team of storytellers, technologists and physicists, who are pushing the boundaries of digitization and material science, and we are fortunate to work with some of the most badass brands in the world.

We are unveiling an entirely immersive future of consumer experience and redefining how luxury home goods (and eventually any good) are bought and sold through unimagined storytelling, immersive technology, and unprecedented, emotionally driven personalization.

Mode Maison has now developed the first and only multi-brand retail platform built entirely on top of digital assets / digital twins and unveiling the digitized retail model of the future. Think: Pixar meets Net-a-Porter / Farfetch.

Much in the same way Pixar changed the world of cinema forever when they unveiled Toy Story in 1995 (the first fully computer-animated feature-length film), this digital transformation (and the underlying infrastructure) unlocks a new world of possibilities. For starters, retail as we know it is erased. Boundaries, erased. Physical realities, erased. Inventory, erased. Environmental impacts, erased. The way we interact with the brands and products around us, erased.

Through our subsidiary Mode Maison Labs, we are collapsing the PLM through groundbreaking proprietary technology.

We are commercializing the underlying sector-agnostic technology that enables both Mode Maison's Platform and an entirely new model of retail; entirely interoperable, flexible, sustainable and scalable.

Our proprietary hardware/software ecosystem, anchored by our Total Material Appearance Capture (TMAC) system, leverages GenAI/ML to enable any company to show/sell their products (true 1:1 twins down to the digital material data level) in a digital, virtual setting without having to create physical SKUs. This allows for decreased capex, inventory spend, and waste, and allows retailers to make or show products on-demand.

**Mode Maison supports all engines and all formats.*

MODE MAISON

WWW.MODEMAISONLABS.COM

Founded: 2018

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

Mode Maison does not play a role in the Digital Product Creation journey. The inherent structure of digitization flat out does not work.

Interoperability, scalability, fidelity, and physically-based accuracy does not exist in the current Digital Product Creation journey, and won't until there's an entire rethink of digitization.

Welcome to the DigitalCore™ Consortium.

The DigitalCore™ Consortium (DCC) is a collaborative effort among global industry leaders from diverse fields to establish a global standard for the digitization of materials and products. By creating an all-encompassing, physically-based, and scientifically accurate representation of real-world materials, DigitalCore aims to unlock the vast potential of digitization across industries.

The Consortium is introducing a genomics-inspired standardization paradigm with the goal of defining the material world around us and establishing the "DNA of materials", an unbiased single source of truth (SSOT) data container. By creating the most holistic material profile converging optical, physical and multimodal mapping data streams, the DCC's aim is to establish the "DigitalCore DNA" that will serve as the underlying infrastructure for digitization standards and enabling a future of physically-based, highly flexible, and exponentially scalable digital capabilities.

The Consortium is bringing together an interdisciplinary and strategic group of members across industries, global brands, Hollywood VFX leaders, major academic and research institutions.

CONTACT



FANTASY MODE

WELCOME: THE FUTURE OF DIGITAL



STEVEN GAY

CO-FOUNDER & CEO, MODE MAISON

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

Mode Maison is not just a company; it's a vision of the future. Our mission is to redefine the way people experience digital environments, to create a world where the virtual is as rich, vibrant, and meaningful as the physical. We believe in a future where digital environments are not just backdrops for action, but integral parts of the story; characters in their own right. We are not just building environments; we are creating experiences, crafting stories, and unlocking possibilities.

Already achievable and brought to life by our cross-disciplinary team of creatives, storytellers, material scientists and physicists, our concept of Future of Environments (FoEs) represents a step change in DPC. FoEs are more than just highly immersive virtual locations or worlds; they represent a paradigm shift in how we understand and interact with the digital realm. They are characterized by unprecedented hyperrealism, scientifically-backed material accuracy, and unrivaled virtual world creation and scalability. They are the key to unlocking true utility in the digital realm.

Our vision goes beyond just creating individual environments. We are also pioneering efforts towards global standardization through the DigitalCore™ Consortium (more on that below). Our goal is to enable truly interoperable and composable digitized futures, where different environments and elements can seamlessly interact and combine, creating a truly unified and dynamic digitized retail model of the future.

This is just the tip of the iceberg. Advanced rendering engines, especially ones where vast amounts of real world / sensed data powers its simulation (ie a neural BRDF model, neural physics-based model/engine, etc), will unlock an entirely unimaginable world. This requires entirely specific interdisciplinary insights and understanding, vast amounts of real world data that hasn't been imagined could be converged…until now… 💡 Enter Mode Maison.

Mode Maison has a very unique history - one that arguably puts it closer to the ground in terms of



THIS IS NOT A PHOTO... IT IS A RENDER

understanding the bleeding edge of industry demand and industry-led innovation than anyone. Walk us through how your first-hand experience as a brand aggregator in the luxury home space turned into the catalyst for building a multi-disciplinary technology team that now has the remit of solving some of the biggest challenges - and unlocking some of the biggest opportunities - in luxury in general. How connected are those two threads?

Our end-to-end digitization technology and underlying technology infrastructure has squarely placed us at the epicenter of industry demand and innovation as it relates to digitization. The implications of our digitization technologies and infrastructure are beginning to transform some of the largest and most innovative brands and companies into entirely digitally-backed, digital asset based businesses and are unlocking a new retail model of the future.

So… how did we get here?

As the last global bastion of luxury to remain nearly entirely offline, the world of luxury home historically has been paralyzed in an impossible position: Brand digitization without brand dilution. Compared to every other industry, the difficulty level is set to 11 and the knob has broken off. Inherent to the luxury home industry, products are categorically large, have nearly infinite SKUs, high manufacturing costs, and as the pinnacle of complexity, products do not, or in many cases never exist in the real world until unless they are ordered (typically less than 1-3% of products offered by brands have ever actually been seen or made by the brands themselves!).

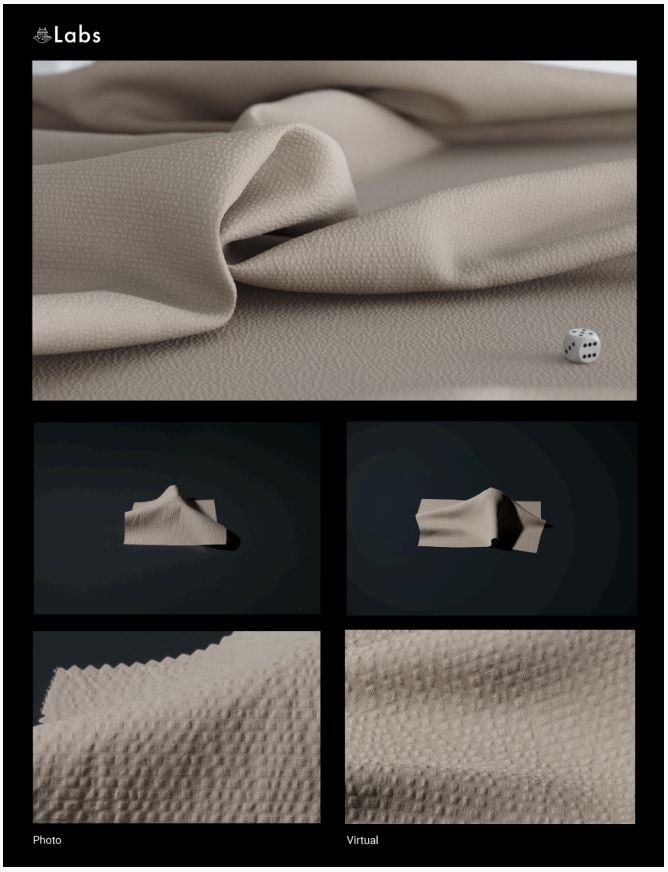
So how do you sell something that doesn't exist, has never existed, would cost more money than even Amazon has (if you were to manufacture every single SKU), and, even if you somehow did have all those, would require the largest and most complex production effort in history (warehousing, global production, set design, logistics, location scouting, massive worldwide photo studios, etc)? Hard enough. Now take that, but multiply it by a thousand. Being luxury, everything has to be more beautiful, more immersive (i.e. shown in more depth and fidelity across different scenarios), more emotionally driven (bringing products to life through visual and exciting storytelling), and as a kicker, with a professionally discerning audience base (both brands and trade consumers). Enter Mode Maison.

Even with the deck massively stacked against this industry as a whole, we embarked on a journey to unlock this industry. Mode Maison is the innovative digital retail platform transforming the $100 Billion+ global luxury home goods industry and is the first and only multi-brand retail platform built entirely on top of digital assets / digital twins.

We redefined how home goods are bought and sold through technology, data and unimagined storytelling, and have broad application not only to home goods (which was first and where we have stacked several massive moats in a category with no other multi-brand players) but also now to any good.

Distilled down, Mode Maison is a dynamic confluence of (1) cutting-edge computer vision / A.I. and (2) a reimagined, immersive future of consumer experience. Think: Pixar meets Net-a-Porter / Farfetch.

We say Pixar very deliberately, because much in the same way Pixar changed the world of cinema forever when they unveiled Toy Story in 1995 (the first entirely computer-animated feature-length film), Mode Maison is in a uniquely similar position. As the first entirely digitally-backed, complete end-to-end digitized retail infrastructure, we've unlocked novel data flywheels and technologies that have, to this point, been impossible to achieve and underpin our capability of becoming the complete, global digitization infrastructure of the future of commerce, what we call "DigitalCore Retail." This is a new model



of retail which reimagines the future of storytelling and consumer-brand interaction enabled by owning, down to the parametric level, the digital data and creating the standardization for every thread that comprises every product.

A lot of brand and retail organizations are, right now, focused on a common objective: creating digital representations of components, materials, and finished products and taking them as far downstream (in terms of fidelity and distance) as they can go. The limits of that approach, so far, are dictated by the fact that each organization is approaching it in their own unique way, as part of their own tech estate. If the shared objective is to create a digital model of retail - to sell products that don't exist yet through a connected, codified ecosystem - then standardization of data, process, and protocol would seem to be the logical next steps. How do you think about that idea of a new, digital infrastructure for retail that provides everyone with a common playbook and an unmoving target?

A lack of standardization of data, process, and protocol would be a death knell for our business.

Our digital infrastructure is predicated on total interoperability, flexibility, scalability and sustainability. As a startup, these are non-starters both for building the multi-brand retail platform side of the business as well as Mode Maison Labs, which licenses our technology ecosystem to brands. There's a lot of creative salesmanship out there, but as we say to our brands, the world of digitization only gets more complex, unless you start from a single source of truth (SSOT), which you can only do by sensing the real world using physics and starting from there. If you start in a computer to create your digital materials you are introducing bias from the start and again, that should be a non-starter for any brand that cares about interoperability, flexibility, scalability and sustainability. And we're okay with sounding like a broken record on this.

This idea coalesced into the need to create and launch the DigitalCore™ Consortium – a key part of Mode Maison's long-term strategy. It is focused on unlocking true composability and interoperability across various aspects of the digital landscape. This includes rendering engines, the entire Product Lifecycle Management (PLM), the entire supply chain, and more. The consortium is ultimately aimed at ushering in an entirely unimagined world of retail and storytelling via unlocked creativity and immersive storytelling.



To be more specific, the DigitalCore™ Consortium is introducing a genomics-inspired standardization paradigm with the goal of defining the material world around us and establishing the "DNA of materials", an unbiased SSOT data container. By creating the most holistic material profile converging optical, physical and multimodal mapping data streams, the DigitalCore™ Consortium's aim is to establish the "DigitalCore DNA" that will serve as the underlying infrastructure for digitization standards and enable a future of physically-based, highly flexible, and exponentially scalable digital capabilities.

Another of the cornerstones of an effective model for an asset-based, all-digital ecosystem that runs from design all the way downstream will be completely accurate material capture and use. This is something we've previously described as being the key to unlocking a domino effect across all the different use cases that fashion brands have envisioned for digital product creation; where the industry wants to use a digital asset, it needs to use fabrics that are physically and aesthetically totally uncompromising. How do you believe your approach (Total Material Appearance Capture) differs from other material digitisation hardware, platforms, and standards? How do you plan to industrialize it and incentivise adoption among suppliers? And what are the key unlocks you're targeting?

Current digitization solutions do not allow for large material digitization, and an A4 paper size scanner is a non-starter. Perhaps that works for a shirt or a sneaker (sort of…) but not for a sofa. We built the TMAC, the largest fully automated, cross-polarized photometric stereo scanning technology (hardware and software) with a 1m x 1m scan area (and is great for small material scans as well) that fully democratizes the digital material creation process for brands, creators, and 3D artists. This enables scientifically based, physically accurate, hyper fidelity digital material creation at scale and complete interoperability across engines.

Incentivizing and educating go hand in hand for us. We love talking to brands in various stages of their digitization journeys. "Good enough" (we hate good enough) is the enemy here, and some brands are talking to us about true digital transformation, some brands understand they need to embrace a digitized world but are not sure how to start, and some brands are going to find themselves in tough positions with bloated workflows and marketing organizations, rising capex, and on the other side of the sustainability conversation.





Our ultimate goal is to democratize our material digitization technology, and one day put our technology inside of an iPhone to create beautiful digital materials parametrically. It's definitely a future state, but every day we are moving closer to that reality.

When it comes to real-time and offline rendering for sales and marketing, fashion is largely using off-the-shelf tools and best practices that have migrated over from other industries, turning rendering engines from architecture, gaming, VFX and other sectors into a patchwork toolkit that functions for fashion and retail but that isn't explicitly designed for it. What do you see as the future for that side of high-fidelity digitisation? And how does Mode Maison think about the balance between developing software and offering services that cover the full scope of digital selling and storytelling?

As much as this is going to irk my friends in the gaming industry, the future of global digitization will not be born from games. The future relies on unbiased sensed data from the real world, which will ultimately unlock an entirely scalable, interoperable, and entirely integrated new world where the lines between digital and physical become so blurred that they effectively become erased. "By gamers for gamers" has been the mandate engrained across CG/simulation technologies from its very beginning, but as we move towards a fully integrated, physically-backed, entirely digitized new future, the fundamental framework for digitization relies on a dramatically new set of principles, or what we call the DigitalCore™ framework.

For us the question of balance is around technology versus storytelling. People ask us, are you a digitization technology company or a multi-brand retail platform that pushes the boundaries of storytelling; and the answer is…"Yes". Before Mode Maison I worked with Ralph Lauren himself on the global creative concepts for Purple Label. Anything "technology" in my mind came at the expense of storytelling, and I had a natural aversion to technology that claimed to somehow augment the creative. When we started Mode Maison, from day one we were cognizant of not building "tech for tech's sake". The CMOs out there have a very difficult job of integrating technology but also being a champion for their creatives. It's not easy, but it's our mission to have technology not just enable the creative but push the boundaries of the creative.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalized - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

Scalable, physically-based, retail DPC pipelines today must rely on unbiased, real world data. Think of this similarly to the Autonomous Vehicles landscape. Prior to sensed "road miles" data generated from the increasing number of AVs on the road, autonomy simply was an idea. However, the more sensed road miles generated from AVs on the road, the more real world data there was to feed into creating meaningfully reliable synthetic datasets on which to train AVs. We are at this same inflection point. The more unbiased, sensed real world data, the increasingly faster and more wild our retail and experiential world will become.

OPTITEX

OPTITEX.COM

Founded: 1988

PRICING MODEL:

Optitex software is delivered in modules based on specific customer workflows.

We offer flexible delivery and pricing options that are tailored to the specific customer needs, including term-based subscription and perpetual licensing options.

Optitex is a boutique software company specializing in product development for the fashion and apparel industry. Our solutions serve at the intersection of art and science, as brands and manufacturers are dealing with the development bottleneck resulting from the growing ability to spin off designs more quickly, but with limited accuracy and low production compatibility.

Our tools provide the highest precision and fit enablement, allowing product development teams to accurately simulate a garment, confidently perform digital fit within the software and move straight to the manufacturing stage with production-ready patterns.

Optitex's wealth of experience, spanning over three decades, is utilized by the ever-growing base of over 30,000 users who use our solutions to ensure their product quality, enhance their efficiency and meet sustainability requirements. To learn more about Optitex, visit optitex.com

HEADLINE CUSTOMERS:

Adidas - Alison Hayes - Arizona State University - ASOS - Beyond Yoga - Carmel - Ciovita - Cirque du Soleil - Cornell University - Elcatex Group - Endura - Fashion Enter - Gap - GAT Fashion Lab - Groupe Eram - Li & Fung - London College of Fashion - M&S - Macron - Maurel - NASA - Next - Nike - Perry Ellis - Rapha - Target - Tommy Hilfiger - Under Armour - Urban Outfitters

30,000 TOTAL NUMBER OF ACTIVE USERS WORLDWIDE.

OPTITEX

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Founded: 1988

50+ TECHNOLOGY PARTNERSHIPS, INCLUDING:

3Dlook - Alvanon - Anthropics - Bandicoot - Bemis - Bold Metrics - Bureau 555 - ByondXR - Centric - Coats - Datatex - Daz3D - Embodee - Emersya - Facton - FigureForms - First Insight - Fit3D - Ideal - JML - LalaLand - Meshcapade - MYR - Ned Graphics - Nvidia - Reactive Reality - Rey - Siemens - Sizemic - Sizer - Spatial - Stoll - Swatchbook - Texel - The Bureau - Transmagic - TrueToForm - Twine - Virtual Retail - Vizoo - Vntana - YKK

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

Optitex focuses on pattern accuracy and predictable fit to enable reduction of returns, streamlined workflows and sustainable production.

Our combined expertise in 2D pattern development and accurate 3D simulation, assures consistency throughout the supply chain and supports true-to-fit processes from the design stage and up until the production end.

With a best-in-market ecosystem of technology partners, Optitex assumes the role of virtual-to-physical enabler, promoting sustainable workflows, dramatic time and material savings, and yielding consumer trust and loyalty.

CONTACT

True to Fit

Cutting edge product development tools



Optitex 3D development tools accelerate and optimise your development to production workflow. This means trusted fit, fewer returns, reduced physical samples, shorter product development time, and significantly less material consumption.

With Optitex you can work faster and smarter, and immediately impact your quality, efficiency and sustainability.

OPTITEX

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AMIR LEHR

CEO, OPTITEX

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

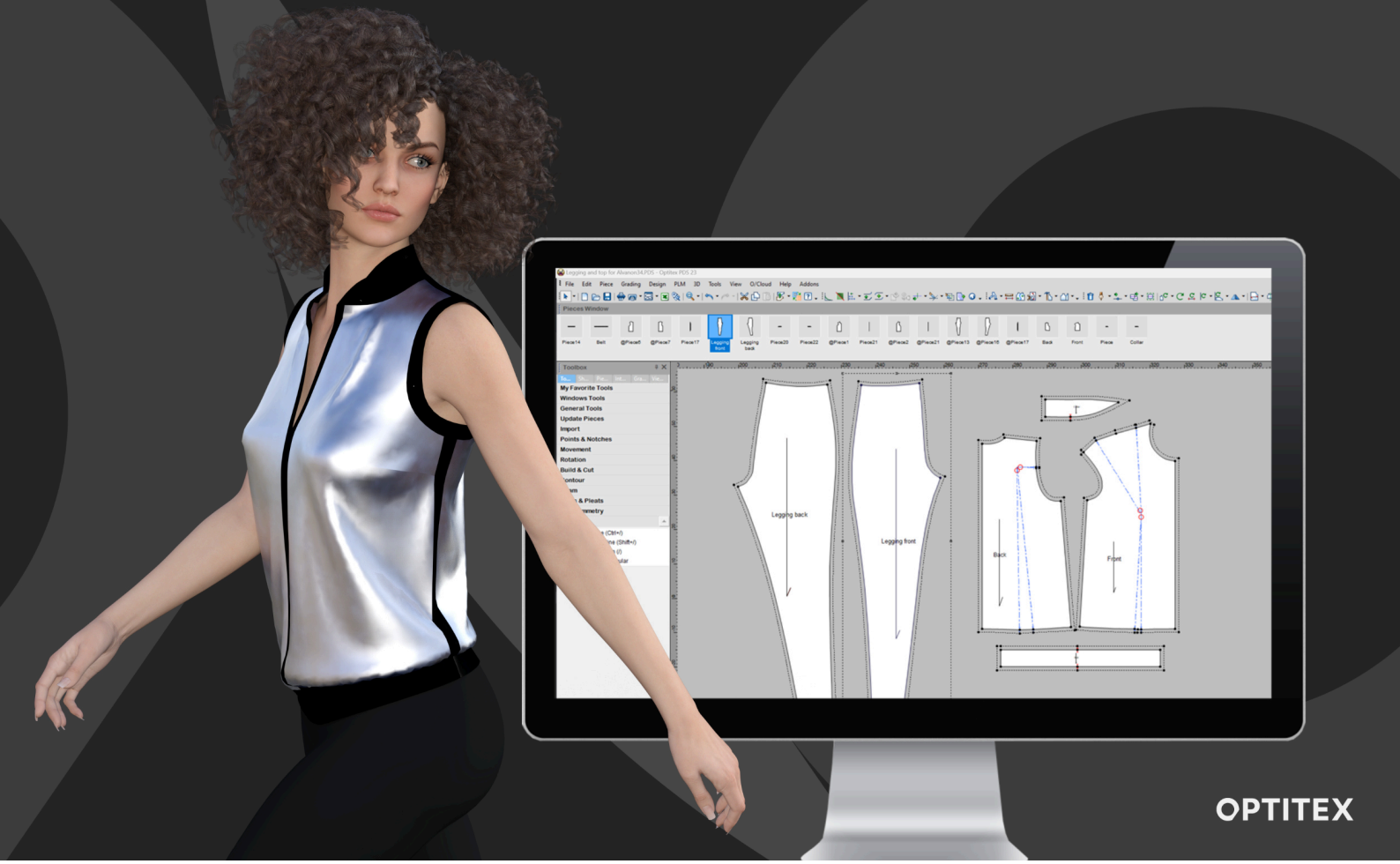
The reach of digital product creation is so broad that I believe you can pick almost any key performance indicator (KPI) or strategic objective and deploy 3D and DPC tools to stand a good chance of improving on it. If I were to pick the top KPIs, I'd say **speed and waste** are two of the most important metrics for every brand at the moment, which means further elimination of physical samples from the process and the further acceleration of the end-to-end workflow.

But I think that the beauty of where we are today is that the industry is maturing, and with that maturity comes a more complex and sophisticated suite of KPIs to choose from: how you elect to use DPC, and how and where you measure the value you get from it. For a lot of companies, those areas will overlap, because the industry has a set of common challenges, but in some areas, they will contrast and you'd have to wisely manage those tradeoffs by prioritising based on your specific focus.

Everyone is trying to create better fashion and **better fit** and, at the same time, trying to address vital **sustainability concerns** and comply with legislation. Success here will look like customers having **more confidence** that what they see on the screen will fit them well with consistency, and this (combined with better product quality) will translate into motivation to wear that item more often, and to keep it for longer.

Then, there's the issue of **cost and margin**. What is the cost to manufacture the product, to deliver it, and eventually, for the consumer, to buy it? How do we, as an industry, optimise all those different elements to help brands deliver better products, keenly priced, that have a reduced impact on the planet? I think 3D and DPC tools have a lot of the answers to these key questions, as well as to the more specific ones that individual brands are asking.

We've seen a lot of brands and retailers really accelerate their DPC strategies, focusing heavily on the design end of the spectrum. As a result, there's the possibility that the industry's approach to scale is becoming lopsided, with high adoption in design translating into bottlenecks in development and production. What are your feelings on how fashion can overcome that bottleneck? Will it come from



conforming different types of workflows to one tool and one technology, or diversifying and growing the solutions and the capabilities that are available to different users?

At Optitex, we are keeping an eye on what drives effective workflows from design to the final stages of production. That's also a vision that the wider industry shares, and I believe that if we take a step back and look at the history of DPC strategies, we can chart that evolution across the whole of fashion.

The initial stage was addressed by putting digital tools into pattern making - that was maybe 10 to 15 years ago - and then the focus moved to leveradge 3D to reduce physical samples and some other areas along the chain, connecting different users both up and downstream.

In the past five years, the focus has definitely shifted to the design phase, where designers had been left behind sketching on Adobe Illustrator, or in some cases, even just using paper and pencil, and this was detached from body measurements and from fabric properties. This hybrid 2D workflow made it very difficult to communicate design intent further down the workflow chain, and that's where a lot of the gaps and the miscommunications that characterised the average product lifecycle arose.

Now, those gaps have significantly narrowed, thanks to different tools for designers that enable them to design in 3D, using digital materials that reflect the look and drape of fabrics. This design-focused ecosystem has made it much easier for designers to really express themselves in 3D, to shorten the distance between an idea and reality, and to help ensure that their work relates to the body measurements, proportions, fabric, colorways, and so on. This has helped to eliminate, or at least greatly reduce, that original bottleneck.

The challenge now comes at the intersection of design and collection reviews and product development, or **the junction of art and science**, where you have alleviated to a degree the design phase bottlenecks, and are now generating more production-ready candidates to be developed. Let's also consider that you have more creative designers and less pattermakers out of fashion education institutes globally. And this is essentially **the new bottleneck**: where you have a huge amount of new power in the design community's hands, which is creating a significant **burden on the technical side of development**, perfecting fit, pattern making, and production preperations.

This is also why, when it comes to the production stage, there are a lot of designs that need a vast amount of work in order to be converted into

producible patterns, and to move forward in a reasonable way. Even though the technical foundation is there, I don't believe that, as an industry, we're effectively connecting design to development, or development to production.

We are seeing different approaches to deploying DPC. For example, in the past in the US, many organisations have shifted the work of creating digital assets to their trusted partners in the Far East, or Africa, or India - the same way that they have devolved responsibility for pattern making to the places where expertise and knowledge are more concentrated. That way, the brand stayed focused on communicating with consumers on social media dealing, raising brand awareness, and then feeding the different sales channels - but abstracting the rest. We now see that starting to change and we witness a pull-in of some of this product development ownership, or at least tighter control, back at the brand's side.

In other places, like in Europe, and especially in the luxury sector, it's different. Consider somewhere like Italy - that stands out as having a lot of respect for accuracy and that hand-crafted, detailed touch and quality - you see many businesses that are vertically integrated. The designers and the pattern makers, and even the producers, are sitting very close by or even in the same company, and that expertise is more evenly distributed and more accessible.

But even with these differences in geographies, we still see a common trend that technical designers and pattern makers - a small and **shrinking pool of talent** - are having to deal with an **influx of new design ideas**, and up until recently, there was a lack of tools that were really oriented at addressing their specific needs. So you have fewer people needing to do more work, and that's a problem the industry - and technology vendors like Optitex - need to think hard about how to address.

But whatever the workflow, and irrespective of supply chain structure - from distributed to full vertical integration - we see a growing need for greater control, visibility, and management of product development, across every product category and every business size. And that's where technology providers like Optitex come in: our tools are designed to release those new workflow bottlenecks, and to provide confidence and reassurance that the volume of development tasks can be handled efficiently and effectively.

Thinking about all that further, it feels as though there's a transition happening where fashion needs to migrate away from the idea that DPC is a single strategic objective, to it being a transformation made up of different disciplines, different workloads, and separate-but-related jobs to be accomplished. Whether they're design tasks - bringing ideas to life - to development tasks that hinge on pattern accuracy and fit, each of them needs a different approach and potentially a different solution. How do you think about developing tools that have the right domain expertise and the right focused capabilities and proficiencies to deliver on those specific needs?

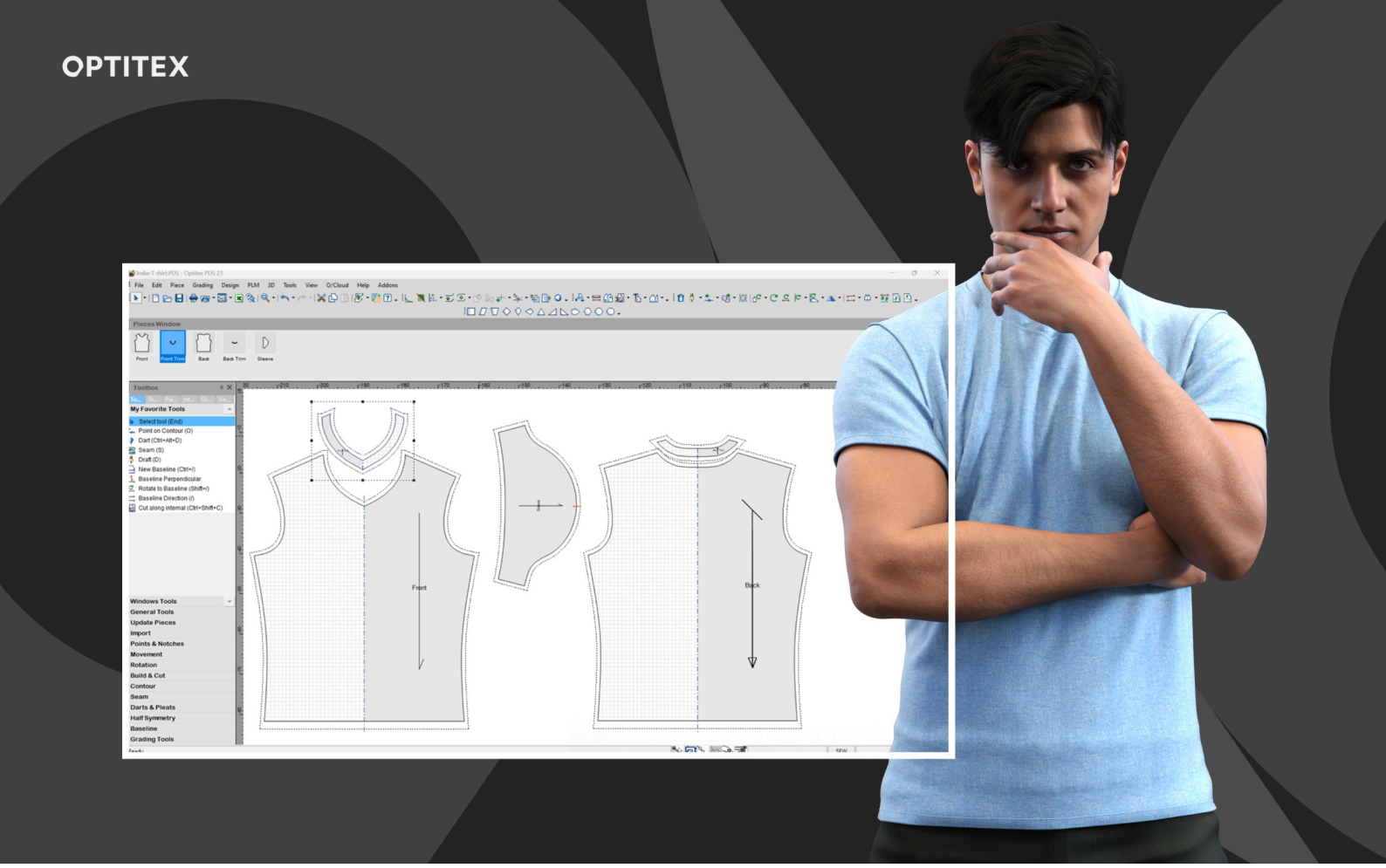
The first challenge, as I see it, is how to move digital assets from one tool to another **without losing a lot in translation**. As you mentioned, there are separate jobs to be done, but the relationship between those jobs must be maintained.

This, I believe, is going to be solved organically in two ways: greater industry maturity and uptake of different solutions will drive interoperability through demand, and as a result, technology companies will realise that **no single solution is going to dominate the entire market**. The days of envisioning a DPC sector that's entirely dominated by one company are over, and I believe essentially every brand that creates or uses 3D assets has a pipeline and an ecosystem built up of multiple different solutions.

In Optitex's case, though, we're confident that no one is going to outpace us in certain areas, and so we feel secure in our specialisms - and that's being borne out by the way our customer base is continuing to increase. There is room for everyone in the market, provided you have something to offer and something that you can add to that overall ecosystem. As a software and solutions company catering to a mature market, you can afford to really focus on certain areas where you have a competitive advantage and have more value to deliver.

With that comes more confidence and openness and a willingness to shake hands with other players in the ecosystem and make sure that those assets I talked about can travel freely from one end to another. The solution that provides the inputs for your users, or that takes the outputs of your platforms and allows others to build on them, is not your competition.

The second challenge is to better **understand the job to be accomplished**, and what each person or workflow element needs. The market has a good idea of the capabilities it wants to create, and the expectation is that technology companies like Optitex will work to build products that meet those needs.



For example: we make product development a high priority in our solutions, as most of our customers deeply value having **accurate fit** - whether that's for customer loyalty reasons, as a tool to help reduce the incidence of returns, or because they are building more diverse collections and moving towards more complex product mixes and short-run production. And some of our customers are even more sensitive to fit in particular areas, because it's the nature of their business. For example, when creating professional uniforms, a collection is designed only once or twice a year, but every person across a broad spectrum needs to be fitted properly. These are not areas where companies are keen to accept compromises in functionality or features, so they are areas we've chosen to specialise in.

In terms of pre-production, too, we have also built even more comprehensive nesting capabilities, and made sure that fabric utilisation and waste reduction are things that our users can easily tap into.

Across the full scope of functionality, our new developments are roughly split into 70% improvements and innovations to core platform capabilities, and 30% oriented towards specific, specialised tasks.

We can anchor a lot of this discussion in a very old question: end-to-end or best of breed? That's been at the heart of most big enterprise technology initiatives for the past few decades, and it's a testament to the maturity of the DPC ecosystem that it's now become the operative question for 3D and digital product creation as well. What do you believe the answer is here? And how have you approached positioning Optitex as a boutique software house with a clear desire to specialise?

At Optitex, we have been on quite a journey with this concept. At the beginning, when we - along with the rest of the technology vendors - were trying to educate and motivate people to adopt DPC, we focused on the end-to-end side because standards weren't mature enough to assure compatibility.

Back then, those partnerships and that interoperability that I spoke about earlier were anything but guaranteed. And we also saw that our customers, at that time, were not willing to invest in multiple tools; they wanted something easy-to-deploy that could address their most burning issues, and they'd try to scale up from there once those critical challenges were solved.

For most of the industry, we are still in that scaling phase. And I think almost everyone reading this publication would agree that meeting the industry's wider expectations has not been a matter of building broader solutions that try to swallow up as much process coverage as possible, but **deeper tools** that deliver what customers really need and recognise when the rest is better left to other, equally deep products that cater to other areas.

At Optitex, we understand product development inside and out. We have people who can converge the knowledge around design and production to ensure that when making a digital twin, it is reliable and trustworthy and producible, and that it will fit human models as well as it fits avatars. We believe we're unmatched in this domain: **linking 3D to pattern accuracy and producibility.**

A lot of fashion DPC strategies are currently being driven by downstream use cases such as virtual photography. Behind those final pixels, pattern accuracy, fit simulation, and producibility still count for a lot, and Optitex have been flying that high-precision flag for a very long time. Do you believe it's as relevant as it's ever been for product development teams and manufacturers to be able to pick up 3D files that began life in design and run with them for virtual fitting and production? Because that seems like the distinction between a digital asset and a digital twin.

I think that it's more relevant than ever, and this relevance will increase in the near future. I see this all as a pendulum that swings between different priorities depending on the most pressing challenge the industry at large is facing. At a given time, that challenge might be production automation, or cost sensitivity, or the explosion of eCommerce.

Right now, in a climate that's being shaped by a very delicate **balance of price, quality, and sustainability**, I think trust is the biggest challenge the industry is facing. Whether it's fit, quality, durability, sustainable materials, ethical labour, inclusivity, or a range of other metrics, consumers are looking for **brands they can trust**, and the value for those brands lies in greater loyalty, reduced returns, and much more.

Critically, those are all elements that I see as being "product development" tasks. Design, manufacturing, and marketing obviously influence those outcomes, but they're principally determined by the decisions taken in product development, and by the tools that those specialised teams have to support them.

Many technology tools have addressed and alleviated problems around design, and now that bottleneck is moving into product development. So I think the spotlight is now on where we have chosen to specialise, as a company, and it will stay here for the next few years at least.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

The most important consideration is to **choose the right tool for the task**, rather than trying to identify and implement an end-to-end solution - and focus on the job to be done rather than the technology behind the scenes that enables it.

From there, the next obstacle for the wider industry to overcome is making sure that users are not forced to become IT experts in terms of managing digital assets and sharing them with other stakeholders in the industry. It should not be inherently more difficult to communicate and **collaborate based on a 3D asset** than a 2D one, but that's not currently the case.

For this to happen, we will need to see better, more respected standards that allow for easier, more streamlined integration. For instance, making it possible for two different companies to support a certain file type and transfer even the smallest details - stitches, cut data and buttons and all the rest - so that **the items stay accurate and producible** as they move between different environments. Today, that breaks down easily, and people end up doing a lot of work that is not their core focus, so valuable time and effort is wasted.

The other thing that needs to happen more than ever before is more cooperation within the fashion technology ecosystem, even between competing entities. This will come as DPC evolves further, and the stakeholders gain the confidence that the playing field is big enough for everyone, but it's something that also needs to happen outside this particular technology segment.

Now is the moment to be **more cooperative than competitive**. The idea is to focus on the customer and deliver more value to them, ensuring they, in turn, can focus on their work and not on struggling with the technology when dealing with taking assets and sharing them with other entities and stakeholders.

As we talked about earlier, there is also an ongoing bottleneck in development that is being exacerbated by a high demand for technical proficiency and core skills that are in very short supply in most markets. Technology has the potential to bridge this gap, and to help democratise pattern development and other technical practices, so there's a very real barrier to scale there that can be at least partially solved by implementing the right solutions.

Taken together, these technology-enabled changes are how we get to the next level of maturity, they're how we get progressively further towards the ideal vision for DPC, and they're a way for the DPC community and the capabilities of its broader toolset to continue to expand.



PTTRNS.ai

WWW.PTTRNS.AI

Founded: 2019

PRICING MODEL:

We offer our SaaS fashion rendering platform with subscription-based packages based on the number of renders and clips required.

Our services like workshops, digital transformation consulting, avatar development, training, and digital asset creation are offered in the form of standard packages fitted to brand needs.

We offer a fashion rendering platform called FLAIR PTTRNS that automates the rendering process of CLO3D files to generate high-quality product images for B2B and B2C sales purposes at speed and scale.

Brands can easily upload their ready CLO3D files of styles with multiple colourways to our platform or via our API. Brand-specific templates are offered to ensure that the images and clips can be directly used for digital lookbooks or e-commerce. The templates contain settings like naming conventions, image resolution, margins, file formats, backgrounds, camera settings and angles, custom lighting (HDRI setups), colour grading, poses and high-quality avatars so brands can create photorealistic output consistently at scale without the need for post-processing. The rendering pipeline automatically improves the realism of styles by, for example, adding a thin layer of fuzz or enhancing the quality of loop embroidery, glitter, puckering and lace while staying true to material and drape characteristics. After visuals have been rendered, they can be downloaded via the platform or directly sent to photography approval or digital asset management systems (DAM).

Next to our automated rendering platform focused on photorealistic quality and scale, we offer custom avatar development compatible with the rendering platform. Additionally, we help brands with 3DPC business case discovery, digital transformation, training and, where necessary, digital asset creation.

HEADLINE CUSTOMERS:

Bestseller - Intersport - Stichd

* We offer our SaaS fashion rendering platform and DPC services globally

PTTRNS.ai

WWW.PTTRNS.AI

Founded: 2019

TECHNOLOGY PARTNERSHIPS, INCLUDING:

3D Software: Alvanon, Clo3D

DAM Systems: Bynder, Creative Force,

3D Scanning for Footwear: Scanologics

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

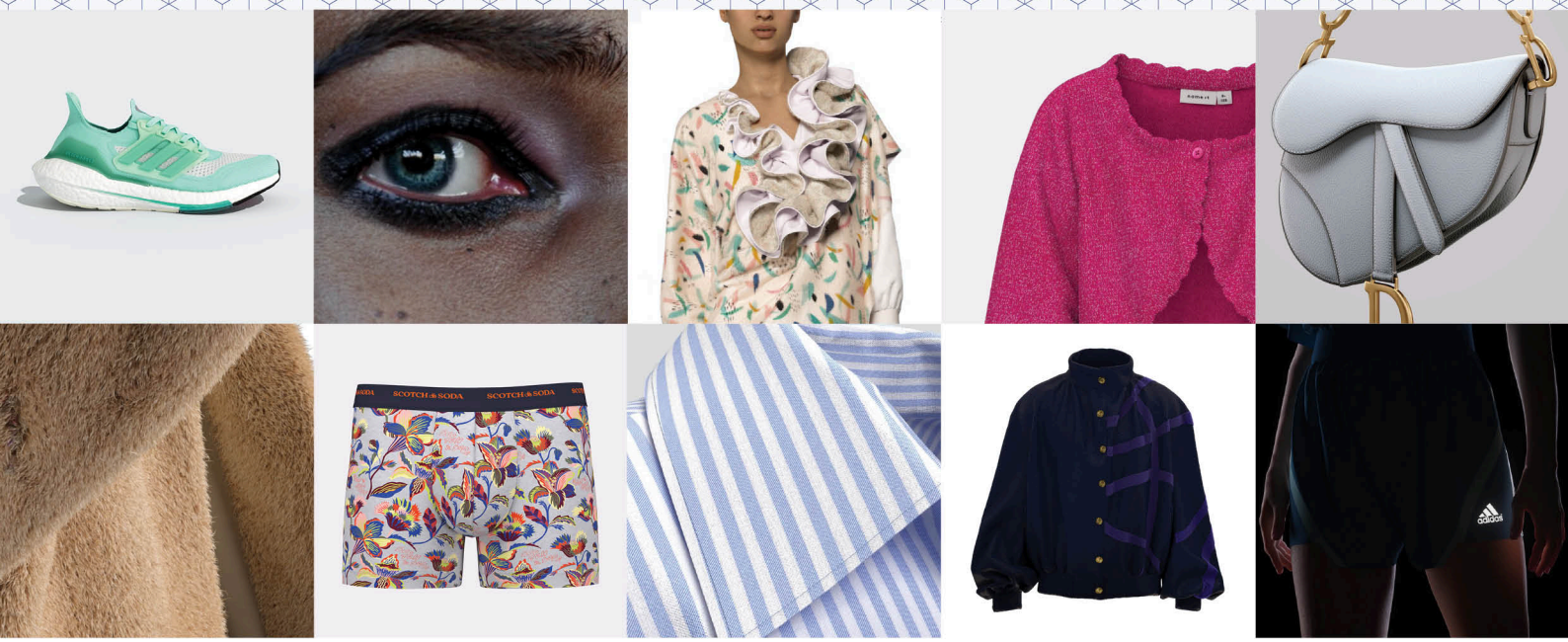
Our FLAIR PTTRNS fashion rendering platform delivering lookbook and e-commerce-ready output for marketing and sales purposes sits in the later stages of the 3D digital product creation journey focused on scaling. FLAIR PTTRNS empowers DPC teams to leverage their product creation efforts beyond the design process with an automated rendering pipeline that generates ready-to-use assets at scale. This way, DPC teams do not have to spend their time and effort unnecessarily on cloud rendering, automation, lighting, colour grading composition, post-processing, etc.

We further offer to take a (temporary) role in helping brands start or scale up the 3DPC journey, with a focus on aligning ways of working, implementing software, and expanding across product categories and teams, thereby achieving efficiency and sustainability. For this, our consulting, digital transformation, and complementary training services come in pragmatic, hands-on workshop formats. After our thorough maturity scan of the organisation and ambitions, we propose and support the software selection process, focusing on product categories that prove business impact, workflows, and standards and, where necessary, (temporarily) bring in a hybrid team for digital asset creation to accelerate the journey

CONTACT

Scale your 3DPC journey

Focus + Training + Asset creation + FLAIR PTTRNS rendering platform



Automatically render 3DPC files into photorealistic visuals for fashion brands



High-quality images and clips at scale

PTTRNS.ai empowers fashion companies to accelerate digital personalisation.
We use artificial intelligence and 3D visualisation to help brands connect with customers, digitally.

PTTRNS.ai



JELLE STIENSTRA

DIGITAL STRATEGY, DIRECTOR, PTTRNS.ai

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

For most of us, the promise of a more sustainable supply chain, reducing physical samples, cutting costs, being more efficient in collaboration and merchandising garments effectively before moving to production have been the reasons to get started with DPC. As most of us have found, it is not that easy; it requires effort and a substantial budget to make a DPC transformation where costs are often added rather than replaced. Consequently, when progress is behind on ambitions, next to tough times, DPC gets pressured.

For me, the 'realistically achievable' part is key for brands and suppliers to ask themselves, and from a consulting perspective, my answer here is 'think big, start small and learn fast'. In practical terms: show that DPC saves time, eases ways of working, reduces time to market, and has an end-to-end (from design to e-commerce) purpose and business case. Focus on a single (simple) product category for which a business case is more than feasible considering cost and effort in non-digital ways of working before embracing (read: overwhelm oneself with) DPC at large. Additionally, think end-to-end in the sense that DPC is not just for the product development departments but that it holds value for the commercial side of the business, too. DPC renders are not just for design iterations and collection approval but can be used for consumer-facing purposes where renders replace product photography costs rather than adding them.

To make 'realistically achievable' feasible, lean on others; don't reinvent the wheel. Delegate photorealistic rendering to automated pipelines like ours and seek companies like ours (and there are plenty) that use DPC's best practices and help with scaling DPC in a viable manner.

How do you see the different roles involved in DPC evolving in the near future, and what share of them can be automated or assisted? At the moment, a lot of fashion designers and 3D designers are also balancing their core talents with the need to develop rendering skills to service sales and marketing objectives, for example. That, though, seems like a looming roadblock on the route to making digital product creation viable at scale.

With Digital Product Creation, brands are not just replacing or training designers and patterns makers to work with digital tools and new ways of working within or alongside day-to-day efforts, i.e. the digital transformation, but also bring in tasks that are traditionally not part of product development departments, like the creation of visuals for marketing departments.

Even though interesting on itself, learning about all the things that come with rendering at scale is not something I believe necessarily needs to take place in DPC teams. Rendering, specifically at scale for marketing quality purposes, entails pipelines, 3D software, render engines, cloud, colour-grading, photography, composition, posing, avatars, motion, camera lighting (HDRI), shading, post-production, etc. In other words, taking responsibility for visuals for marketing purposes brings an additional workload where DPC teams might need to focus on digital product creation itself instead.

Our fashion rendering platform, FLAIR PTTRNS, empowers brands to focus on digital product creation and hand over the ready CLO3D files to our automated pipeline to generate visuals for various marketing and in-sales purposes. The benefits of delegating this work are in truly leveraging DPC beyond collaboration, design efficiency and reducing time to market. By using our platform, brands have the advantages of rendering at scale (dozens of visuals in the cloud without using your own computer power), in a consistent manner matching brand visual guidelines, with photorealistic quality beyond what is possible in CLO3D, and directly replacing costs of traditional product photography.



Tell us about the AI portion of the work that PTTRNS does, and how you see digital product creation linking in to digital personalisation.

DPC is at the start of an exciting new future, in which artificial intelligence will play a big role. We have already put this into practice. Next to our cloud rendering pipeline, we also develop recommender algorithms for apparel (eyewear, footwear, and fashion) that help customers discover the products that best suit them so they can make confident and conscious choices when buying products. With this other digital personalisation solution, called STYLE PTTRNS, we specifically focus on understanding customer psychographic preferences and desires on an aesthetical and stylistic level and match the right products to help brands and retailers connect with customers directly, increase conversions four-fold, increase customer-life-time-value by giving good advice and reduce returns.

For our fashion rendering platform, FLAIR PTTRNS, we aim for high quality and believe that staying true to the actual garment design, fit, and draping is crucial. Artificial intelligence, especially generative AI, is well-equipped to 'imagine' things, finding patterns in what computer vision perceives and filling in gaps. However, the state-of-the-art algorithms won't suffice for now when generating photorealistic images that capture products as intended. AI might do quite okay for plain shirts, but it will already get tricky when it comes to imagining buttons that are not in the design, let alone specific prints. Therefore, we use little AI in our visualisation pipeline for DPC and chose to rely on the accuracy of rendering for the time being.

That said, technology develops rapidly, so we keep an eye out and will see what the future brings. To speculate, it is not a far stretch from using high-quality renders and interactive experiences with 3DPC assets in STYLE PTTRNS fashion personalisation when you imagine the possibilities of staging digital garments against personalised backgrounds and on avatars that customers can identify themselves with.

As we've seen elsewhere in this report, there has recently been an explosion of downstream uses cases for digital assets - spanning sales, marketing, eCommerce and more. And that's creating a significant gap between the demand that brands and retailers have for digital products, and their ability to meet that demand. How do you see your easy-to-use rendering platform bridging that gap?

I recognise this demand from brands for using digital assets in various use cases. As such, we have developed our flexible automated rendering pipeline to provide diverse visual output. We offer various digital asset formats ranging from lower resolution images for the design process to mid-quality for internal product approval meetings, up to high-quality pack shots, and 360 clips for B2B and B2C sales. Additionally, FLAIR PTTRNS goes beyond conventional visual outputs by providing photorealistic editorial visuals, complete with human-like avatars and elaborate (or studio) backgrounds. We aim to help brands leverage the already ready 3DPC styles developed in CLO3D to replace commercial and editorial product photography without additional effort from DPC teams.



What excites me is that our platform can take in a single 3DPC CLO3D file with multiple colourways and produce all the visual formats mentioned before. The brand-specific templates warrant consistent output fitted for each use case. Our standards of automatically handling 3DPC files further offer the opportunity for brands not just to produce visual output for themselves – aligned with their visual brand identity in terms of camera angle, background, and lighting – but also those for specific retail or marketplace channels that have their own requirements for visual standards to achieve uniformity.

Essentially, FLAIR PTTRNS empowers brands to create visual content for their internal use and to tailor photorealistic visuals for their specific retail channels, thereby expanding its utility and scalability.

What do you believe are the processes and links in the current DPC workflow that will benefit the most from automation? And how will that automation help brands to deliver on their visions for speed and scale?

It would be obvious to state that rendering within the DPC workflow would benefit most from automation since brands seek consistent, high-quality output at scale. Even though I will not deny that – given that our platform fills exactly that gap – I also believe it is key to link up the various tools and workflows within the DPC landscape.

I recognise a need for aligning technical standards and reducing overhead in the DPC workflow. For instance, aligning on technical aspects of colour-grading standards or file naming conventions makes sense throughout the journey of a 3DPC file. I also see a lot of manual work being put into creating and maintaining overviews to manage files do simple handovers between tooling. Is the CLO3D file signed off? Is the bill of material complete in the PLM? Are the correct renders being made in FLAIR PTTRNS? Are the renders ready for e-commerce and available in the DAM? In short, it is easy to lose track while the process is also quite repetitive, thus very fit for automation.

Our approach to aligning technical standards and smoothing out the tedious manual labour of keeping track of what is happening between tools is to offer API access. We offer brands – next to access to the rendering platform itself – the opportunity to connect their PLM and other systems to our rendering platform, automatically upload their files, and kick off the renders for the different colourways with a template that delivers visuals with the correct resolution, margins and background. Additionally, FLAIR PTTRNS has an API for the ready visuals to be sent directly to image approval tools like Creative Force or digital asset management systems for e-commerce distribution.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

We are still quite far from what would be ideal. As a DPC community, I think we are at the forefront, pioneering. We are still exploring what ideal means and will most likely discover that ideal will be different for each brand given its product categories, suppliers, digital maturity, resources, software landscape and so on. As such, I can merely speculate about future barriers, but they are likely in the realm of lacking technology compatibility standards in ways of working and finding and training skilled people. I can, then, invite vendors to (continue to) take an open approach when it comes to collaborating and tech compatibility, offering APIs, matching file format standards and perhaps working towards a more industry-standard way of working despite the different features of the various DPC tools.

To sober things up before sharing my glimpse of hope. Digital product creation – as a set of tools, mindset, and a way of doing fashion digitally – is young, novel, exciting and bound to be a bumpy ride for the years to come. Transforming comes with investment, effort, risk, failure, and tons of learning before arriving at more efficient teams, reduced time to market, sample reduction and development-on-demand.

That said, DPC does promise to make for an efficient and more sustainable fashion industry and leveraging the digital assets end-to-end (from design to ready visuals for e-commerce replacing (not adding) costs) makes for a viable business case. As you can understand, we are happy to help brands find scale in this transformation process and support with automated rendering.



ROMANS CAD Software

WWW.ROMANS-CAD.COM

Founded: 1985

PRICING MODEL:

One-Time Purchase *(Perpetual License) This is accompanied by an additional maintenance contract that includes updates and customer support)*

Subscription *(3-year plan) includes updates, maintenance, and customer support during the subscription period.*

Founded in 1985, Strategies©™ is a dynamic company that provides a complete 360° CAD/PDM digital platform – Romans CAD©™ (The name Romans was chosen to honor our original partnership with the players in the women's luxury footwear industry in Romans) - specifically designed for the footwear and leather goods industries. The company is the result of a commitment to breaking down traditional barriers and reimagining the future of footwear & leather goods design and engineering around a digital twin.

With an innovative team of experts well-versed both in technology and industries' specificities, Strategies has developed Romans CAD©™ - a suite of cutting-edge 3D, 2D, Cut, and PDM software and services that have set new standards in the industry.

One of the most significant advantages of Strategies is the completeness of the Romans CAD©™ suite: 3D, 2D, SL, Cut, and PDM natively integrated.

HEADLINE CUSTOMERS:

Adidas - Berluti - Clarks - De Montfort University

Deckers Brands - Flexi - Hermès - Jones and Vining

Louis Vuitton - Mephisto - New Balance - Nike - Red Wings

Shoe - Steve Madden - Target - Wolverine Worldwide

2,500 TOTAL NUMBER OF ACTIVE USERS WORLDWIDE, ACROSS THE FOLLOWING REGIONS:

350 NORTH AMERICA

1,000 EMEA

650 LATAM

400 APAC

ROMANS CAD Software

WWW.ROMANS-CAD.COM

Founded: 1985

10+ TECHNOLOGY PARTNERSHIPS, INCLUDING:

Adobe Substance - Coloro - FDRA - Juki / Mitsubishi - Material Exchange - Orisol - Pantone X-Rite - Sabal - Swatchbook

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

Romans CAD©™ digital platform is the spine of your product development and the key tool brands and factories will need to reduce drastically their Time to Market and face upcoming challenges in the industry (traceability, sustainability, automation, design scoring, collaboration, etc).

Romans CAD©™ is the technical provider for factories and their production needs (sourcing, nesting, cutting, stitching, tooling, factory 4.0, etc.).

Romans CAD©™ facilitates also the publishing of 3D models to share feedback with your sales, marketing, retailers, distributors, etc. and allow SMUs creation.

CONTACT


ROMANS CAD
Software
POWERED BY ROMANS CAD© ™



JEAN-PIERRE PEDEBOY

CEO, STRATEGIES

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

In today's competitive business environment, staying ahead of the curve and achieving sustainable growth is a formidable challenge. One of the most effective ways to meet this challenge is through strategic investment in tools and talents. I believe opportunities arise when companies in footwear and leather goods invest in nurturing their product development capabilities, as well as the talented individuals and cutting-edge tools that drive innovation.

Innovation is the lifeblood of any successful business. Investing in state-of-the-art tools and technology empowers product development teams to enhance their productivity. DPC tools such as the Romans CAD / PDM 360° digital platform (covering 3D modeling, 2D patterns, material consumption, material & components library, sustainable BOM, SKU management, pre-costing, etc.) provide the means to prototype and validate products faster and more accurately. All these steps must be undertaken before producing the 1st prototype. Only with this method, a brand will be able to reduce the time to market. The engineering of the product must be moved back at the brand design level.

The CAD-PDM integration proposed by Romans CAD©™ allows design teams to work more efficiently, no matter where they are located. By having all the digital product information very early in the process, Romans CAD©™ allows for quicker decision-making, real-time feedback, and simultaneous work on different aspects of product development, ultimately expediting the time to market.

In conclusion, it is obvious that investment in DPC is a strategic imperative for footwear and leather goods companies seeking to thrive in the modern business landscape. It fosters innovation, improves product quality, reduces time-to-market, enhances cost efficiency, and ensures competitiveness. Companies that make these investments now will not only meet the needs of their customers more effectively but also secure their future growth, and margins and abide by the upcoming sustainability rules.

How do you define a "digital twin"? It's a term that's used a lot in 3D / DPC circles, but it's one that has a very loose definition. And what does it mean, in your opinion, to adopt a digital twin as the foundation of a different, more collaborative way of working?







A digital twin can be defined as a virtual, 3D data-driven representation of a physical shoe/bag or any other product, encompassing every intricate detail (design, sizes, materials, manufacturing processes). It is a digital replica that mirrors the real-world product in every aspect offering a lifelike rendering of the product.

The 3D digital twin embeds the global information belonging to the product (geometry, measurements, materials properties, testing, etc.) and their meta-data (ex: supplier, price, Higgs/ sustainability indexes, production centres, country of sales, duties, etc.). It provides insights into the manufacturing process (parts, components, operations, stitching, cutting, etc.).

Adopting a digital twin is the spine of a complete collaborative way of working and represents a significant shift in how the footwear/leather goods industry approaches the product development process. In my opinion, this approach signifies several key principles and advantages:

Collaboration: First, the digital twins provide a shared platform where all stakeholders, from designers to manufacturers to marketing and commercial teams, collaborate in real-time. This level of transparency and immediate communication fosters a more cohesive and integrated approach to product development. Then, the footwear/leather goods industry is globally distributed, with different aspects of production occurring in various locations and generally working in asynchronous mode. A shared digital twin enables geographically dispersed teams to work together seamlessly (synchronous mode) and collaborate on the same up-to-date model. Finally, a digital twin acts as a common language (based on a unique data set) that everyone involved in the product production process understands. It optimizes communication (in terms of quality and data quickly available), reduces misunderstandings, and enhances productivity.

Iterative Design and feedback: The digital twin allows for continuous design iterations. Designers can work on the 3D, make changes, and instantly share those with the entire team (2D pattern, consumption of materials, costing, etc.). This iterative process encourages feedback and creative input from various parties, leading to better, more refined designs.

Reduced Physical Prototyping: Based on a validated digital twin, the production of the 1st prototype corresponds exactly to what the design studio have created. Consequently, the number of physical prototypes is significantly reduced. This not only saves time and money but also minimizes the environmental impact associated with creating physical samples. It also helps control the product follows new sustainability regulations.

Customization and Personalization: The digital twin facilitates the creation of customized product options. Designers can work closely with marketing and sales teams to meet market trends through SMUs. This collaborative approach fosters brand loyalty and customer satisfaction.

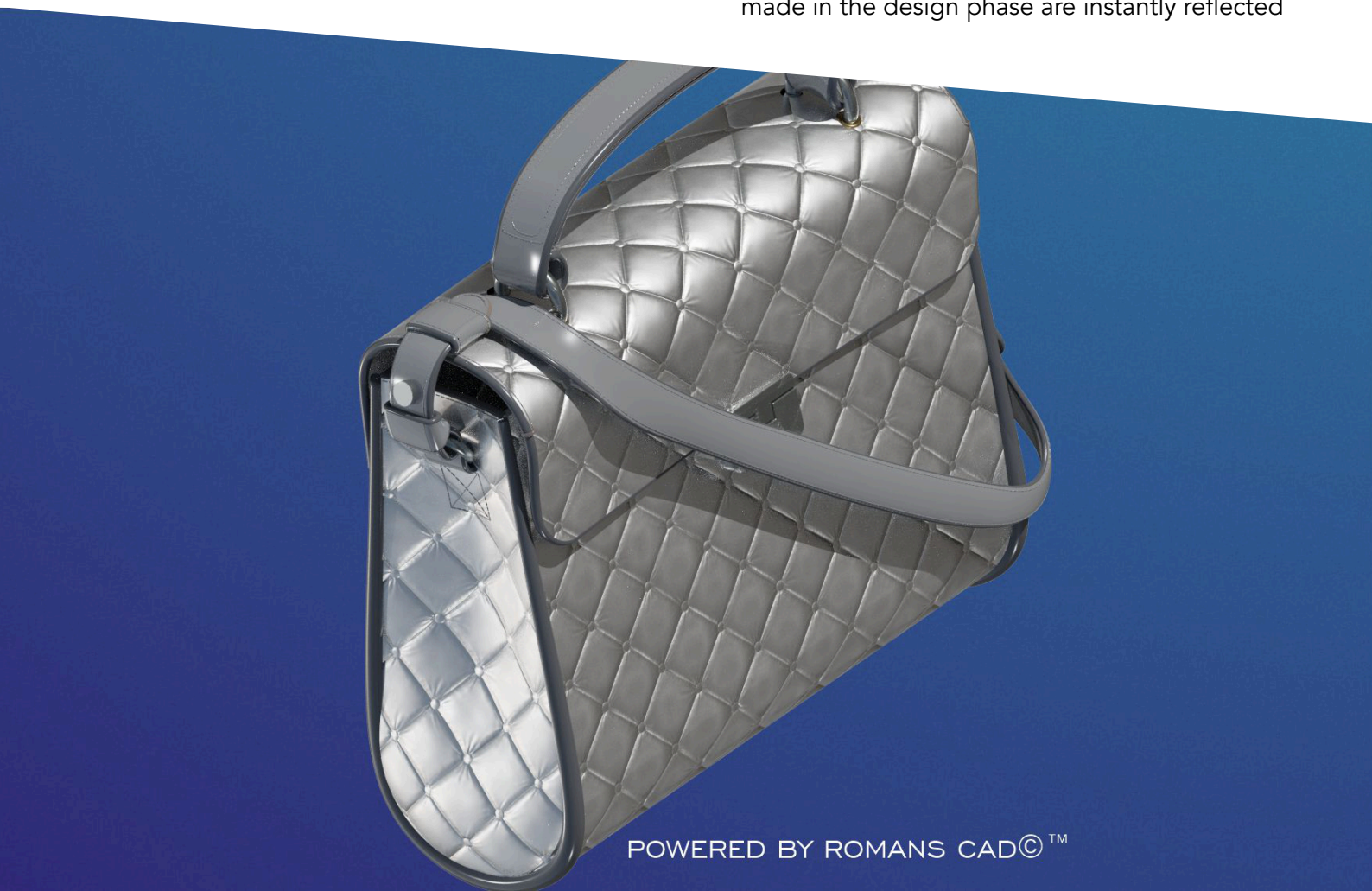
Productivity and Cost Savings: By reducing the number of physical prototypes, streamlining the design process, and minimizing errors, adopting a digital twin can lead to significant cost savings and improved operational efficiency in the footwear/leather goods industry. In addition, since the digital twin comprises all the data related to the model, one can easily replace a material by another for cost purposes.

Adaptability and Innovation: With the ability to experiment within the digital twin environment, the footwear/leather goods industry can explore innovative designs, materials, and sustainability initiatives more easily. This adaptability is crucial in an industry that is continuously evolving to meet market demands.

In conclusion, adopting a digital twin fosters a dynamic and collaborative environment where creativity and data-driven decision-making coexist, ultimately leading to a more efficient, sustainable, and customer-centric footwear/leather goods development.

For the footwear industry, the closer link between design and engineering creates a unique demand for bringing together 3D, 2D, and product data into a cohesive whole - where the digital asset serves as both the product definition and as a tool for visualization. Why do you believe that unified approach is the right one, and how does it differ from the preconceived ideas our readers might already have about how 3D and PLM / PDM interoperate?

The native integration of 3D/2D/Cut and PDM into a single digital platform creates a unified product development environment that streamlines workflows and enhances 3D design/data in a synchronous mode. Romans CAD©™ 360° digital platform promotes a data-driven approach to product development, ensuring that changes made in the design phase are instantly reflected



in both 3D/2D representations and PDM. This suppresses errors and discrepancies at the end. Indeed, today, most companies still work in an asynchronous mode where each time they modify the 3D or 2D, they must go through every step of the process to manually update and then input the updated data in the PLM/ERP.

Romans CAD©™ seamlessly combines 3D modeling, 2D pattern design, consumption of materials, tech pack, and PDM functions into a single platform ready to use. This streamlined workflow reduces time spent on manual data editing and suppresses errors that can occur when using disparate software tools. Stratégies Romans CAD©™ provides an API that allows for seamless communication and data transfers between the PDM and the chosen PLM/ ERP system. The PDM - ERP/ PLM integration is a game-changer for footwear companies helping them to manage the entire product lifecycle efficiently and accelerate time to market.

One of the most significant advantages of integrating our PDM with a PLM is the automation of various tasks. The synchronization of data such as product specifications, materials, design changes, and reports (BOMs) is automatically made between PDM and PLM. This eliminates manual data input to PLM, reducing errors and saving time.

In footwear - especially where new platforms new R&D, and new tooling are required - the time it takes to bring a new product to market can be extremely long. How do you aim to help your customers reduce time to market? And what other benefits does that bring?

The role of the Romans CAD/PDM digital platform is pivotal in enabling footwear companies to expedite their product development cycles and remain agile in response to evolving consumer trends. Through this workflow, the digital twin and its Tech Pack can be shared with all stakeholders for validation before producing any prototype.

To facilitate access to the digital twin by non-CAD users, a BtoB application, Showcase, is integrated within the platform to allow them to be involved in the product validation process. They are also able to create SMUs and pre-orders.

Another worksite of the R&D department is accelerating automation and AI-powered features within 3D/2D/SL – this significantly reduces manual effort and speeds up the design process. Tasks such as pattern making and material calculations are automated, saving valuable time.

What role do you see 3D and DPC-ecosystem tools and processes playing in enabling brands to measure and manage the environmental impact of their products and collections? And how will that factor into their ability to comply with existing and upcoming sustainability regulations?

3D and DPC constitute the spine of the data collection plan everyone will need to meet the upcoming sustainability regulations. Evaluation of your carbon footprint starts right from the first design, as mentioned by the FDRA in its latest call to the industry when discussing the regulations coming up in the US and Europe. Traditional product design and development involve creating numerous physical prototypes before agreeing on the final one, which implies a substantial waste of materials.



So, I am convinced that 3D Digital Twins and Digital Product Creation are essential tools since they help reduce waste and improve material efficiency, optimize supply, and retail chains, and enable sustainable decision-making throughout the product lifecycle.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalized - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

The ideal 3D/Digital Product Development pipeline should start at the brand level with the design, tech pack, and validation processes, all happening at the 3D level before moving to the 2D and manufacturing.

The adoption of 3D and DPC in the footwear/ leather goods industries is growing, but several barriers still exist.



Resistance to Change: Employees and stakeholders may be resistant to changing from traditional design and prototype production. Convincing them to embrace digital processes can be a challenge. An important support is mandatory to succeed.

Costs of DPC solution: Generally speaking, companies consider DPC projects as costly. Very few are aware of the real cost needed to develop their own collection. The consequence is that they are not able to correctly assess the DPC's ROI. When calculated properly, the ROI is by far positive in the following 2 years for the companies.

Integration with Existing IT Systems: Transitioning to 3D and DPC may require integrating them with existing PLM/ERP, etc., which can disrupt established workflows. That's when our API comes into play. There is no need for manual input from one system to the other anymore!

Market Competition: Companies may be hesitant to adopt 3D and DPC if they perceive that their competitors are not using these technologies, leading to a "wait-and-see" approach. However, we are witnessing a change in the market, reinforced by upcoming sustainability regulations. Brands that have implemented a comprehensive digital twin and data collection plan will be better prepared and will also enjoy an increase in productivity, reliability, and profitability as it is already the case with many of our clients.

Adopting the 3D and DPC at full scale in the footwear industry requires a concerted effort from all stakeholders. Successful implementation of DPC will rely on the alignment of technology, collaboration, communication, and integration sustainability.

It is a corporate issue, not a department issue. The challenges are the same in Leather Goods.

SEDDI

WWW.SEDDI.COM
WWW.TEXTURA.AI
WWW.SEDDIAUTHOR.COM

Founded: 2017

SEDDI is a science-backed software company that has created a platform that links Digital Product Creation and Digital Product Development from textiles, to virtual try on. Our collaborative cloud-native simulation and 3D CAD solutions are used by brands, designers, and manufacturers to easily create digital textiles, garments, and human forms culminating in the first true virtual try-on of clothing on consumer avatars. With years of scientific research and numerous patents behind our technology, SEDDI leverages advanced simulation methods and AI-based neural networks trained with the most detailed and accurate optical and physical data in the industry to generate true-to-life digital twins that are revolutionizing the way apparel is developed, marketed, and sold. SEDDI is headquartered in New York City, USA with operations in Madrid, Spain, and Halifax, Canada.

HEADLINE CUSTOMERS:

Alpine Creations - Arc'teryx - Bestseller - Dillards - Faryl

Robbin - Levis Strauss - Life Is Good - Lolë - Material

Exchange - Parallel Innovations - Perry Ellis - Under Armour

ACTIVE USERS WORLDWIDE SPLIT ACROSS THE FOLLOWING REGIONS:

30% NORTH AMERICA

20% EMEA

15% LATAM

35% APAC

PRICING MODEL:

SEDDI's products are available by monthly or annual subscriptions.

SEDDI Textura: Subscription plans are available at Free, Standard, and Enterprise levels. All plans allow for unlimited users, and Standard and Enterprise plans offer unlimited digitization. Users can choose the plan level that meets their storage and workflow needs.

SEDDI Author: Standard and Enterprise subscription plans are available. Both plans offer unlimited users. Choose a plan based upon storage and rendering volume needs. Additional fees required for blanks style setups and extra training.

Detailed pricing information is available on SEDDI's websites.

SEDDI

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Founded: 2017

30+ TECHNOLOGY PARTNERSHIPS, INCLUDING:

SEDDI Textura Technology Partners:
PTC FlexPLM - Shima Seiki - Adobe - URJC - NC State University

SEDDI Textura Works With:
Browzwear - CLO - PTC FlexPLM - Maya - Unreal - 3D Studio Max - Arnold - Blender - VRay - Unity - SEDDI Author - Adobe Substance - Emersya - Pointcarré
Any software supporting a PBR workflow
Any software supporting U3M

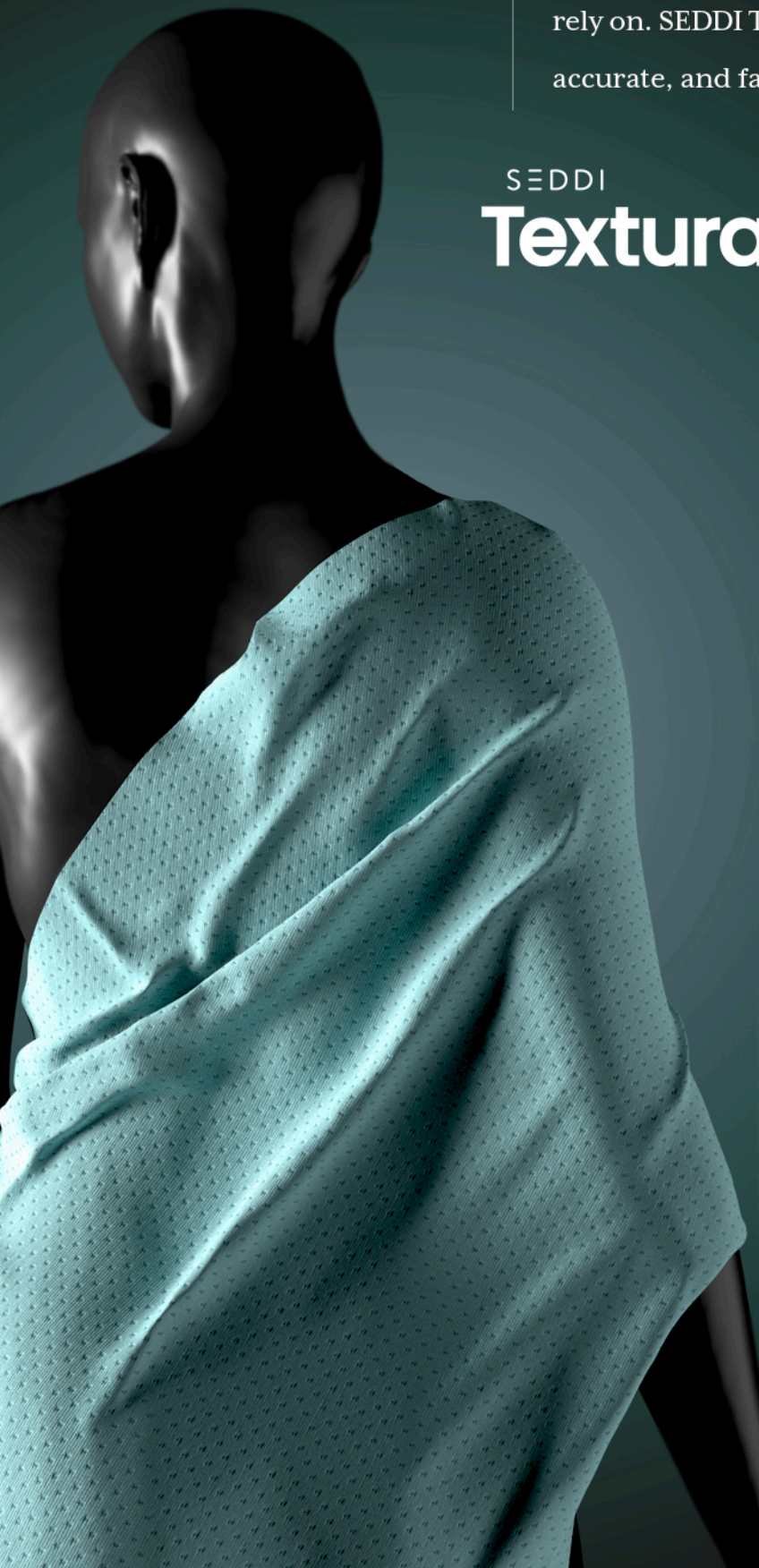
WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

At SEDDI, we recognize the value of both digital product creation and digital product development, and deliver software that covers both ends of the spectrum, from digital textiles to virtual try-on. We believe that by seamlessly linking digital product creation and digital product development, brands can achieve greater speed, sustainability, and innovation while delivering high-quality, market-ready apparel and products.

CONTACT

Your digital garment is only as good as your digital fabric.

Develop products digitally on fabric foundations you can rely on. SEDDI Textura is the industry's most accessible, accurate, and fast platform for fabric digitization.



SEDDI Textura Helps ALPINE CREATIONS

SEDDI Textura has proven to be a catalyst in driving the transformation of our digital journey, specifically our fabric digitization process. Beyond boosting productivity, SEDDI Textura's textile digitizing solution has played a pivotal role in enhancing the accuracy and efficiency of our 3D garment development. At Alpine Creations, sustainability is at the forefront of all we do: By incorporating digital fabrics into our design process, we are purposefully advancing towards a future whereby we are actively transitioning away from physical samples, thereby helping to contribute to a more sustainable tomorrow. This deliberate integration of innovation and environmental responsibility underscores the dual benefits of improved design processes and a reduced ecological footprint too.

-Anupam Nijhawan, Head of DPC and Sampling, Alpine Creations

by 2024 — 2x

by 2025 — 5x

The amount Alpine Creations will grow its digital fabric library in 2 years using SEDDI Textura

BOOK A DEMO

Join the brands and suppliers enjoying frictionless fabric digitization.

ALPINE CREATIONS · Levi's · PERRY ELLIS · ARC'TERYX



GRAHAM SULLIVAN

CEO, SEDDI

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

I think the greatest opportunity in 2023 and 2024 is for companies to effectively bridge the gap between digital product creation (DPC) and digital product development (DPD) processes, to really take advantage of the efficiencies and competitive advantages digital processes offer.

Digital product creation and digital product development are two complementary processes. They are both essential facets of our industry's transformation, with digital product creation accelerating innovation and digital product development reducing time-to-market and enhancing accuracy, quality, and sustainability.

At SEDDI, we recognize the value of these processes and deliver software that covers both ends of the spectrum, from digital textiles to virtual try-on. We believe that by seamlessly linking digital product creation and digital product development, brands can achieve greater speed, sustainability, and innovation while delivering high-quality, market-ready apparel and products.

Like most technology segments, digital product creation will be undergoing new scrutiny in the current fashion and retail climate, with a higher bar to clear in order to justify continued investment. Whether it's speed to market or sustainability, how do you believe the industry should be aligning DPC strategies with overall business objectives to secure a return on investment and to future-proof the way they work?

Adoption of digital design processes isn't just a technological shift; it's a strategic imperative. First and foremost, fashion and retail businesses should recognize that digital product creation alone will not justify continued investment. The vast majority of digitization benefits come from DPD where we can reduce the waste of physical samples and get to market faster. Digital product creation and development processes together need to be woven into the fabric of an organization's DNA to see the ROI. This means cultivating a culture of innovation, and embracing digital first processes as a long-term commitment, not just a short-term fix.

What it's fixing is inefficient, disparate, physically-reliant processes that are creating waste in the apparel industry in terms of time, money, and sustainability concerns. We have reached an inflection point where it's becoming painfully apparent that in order to stay operational, profitable, and importantly, relevant in this changing world, retailers and brands need to embrace change. This change means transitioning to digital at each stage of the supply chain and lifecycle of a garment—from digital textiles, to 3D apparel engineering, and in time, true virtual try-on.

Moreover, adoption of digital design and development processes should be seen as an enabler of faster and better decision-making. The wealth of data generated

through digital first processes can be harnessed to gain valuable insights into consumer preferences and market trends. This data-driven approach allows businesses to make informed choices quicker which is essential for increased competitiveness, and makes it possible to more clearly align DPC and DPD strategies to business objectives and develop meaningful ROI.

The more 3D and DPC strategies scale, the greater the demand for digital materials that accurately represent their physical counterparts, and that bring brands and their upstream partners closer together. Meeting that demand, though, is a tall order, with high bars to clear in pricing, scalability, and speed. How is your Textura solution aiming to help the industry overcome those hurdles?

It's true, now that DPC is gaining traction, the demand for fast, reliable access to the foundation of digital apparel—digital textiles—is growing. Digital textiles don't often receive the spotlight in conversations around 3D design and development, but ask any 3D or technical designer and they'll tell you—your garment's digital twin is only as good as the digital twin of your fabric.

SEDDI Textura leaps over industry hurdles, one by one. We built the platform to address the key concerns of accessibility, interoperability, and speed. To remedy speed and scalability challenges, it only requires an affordable desktop scanner and SEDDI Textura's AI-powered platform to digitize fabrics at scale. And because the platform is cloud-native and sharing-enabled, it solves collaboration challenges between brands and suppliers instantly. Even if a supplier or mill doesn't have a paid account, they can collaborate with brand partners on a free plan.



Since all of SEDDI's products operate on a software as a service model, we are able to offer accessibly priced, flexible subscription options that work for both brands and suppliers. It took a team of incredibly intelligent PhDs, engineers, and developers 5 years to reach this point, but SEDDI Textura is here, and it delivers the foundational need for the industry to succeed in DPC and DPD.

One of the key promises of working in 3D has always been the ability to quickly visualise ideas, improvements, and iterations. A strong example of that is the placement and customisation of artwork and graphics - which is a fast-growing market segment - where adjusting placements and visualising the results can cut sampling time down to minutes, and help avoid waste and inaccuracy. How does your SEDDI Author solution cater to that market? And how do you approach bringing together the brands that have a heavy emphasis on graphics, and the supply chain partners who need that absolute accuracy in technical specifications?

This is a great example of an area where digital product creation and digital product development intersect. Through years of 3D garment engineering development that has produced apparel simulations that are accurate down to the seam and stitch level, SEDDI Author ensures that what brands and custom apparel suppliers are creating digitally, translates into exactly what is produced physically.

The customization of artwork, logos, and graphics is a hallmark of our SEDDI Author platform. With a high-level of accuracy, brands can tailor their designs to meet their unique requirements, and supply chain partners can leverage the production-ready final proofs that are created to ensure that these customizations are executed with precision.

One small mistake can equate to a huge amount of waste for brands that



deal with graphic apparel. Misprints and excessive physical samples can be avoided, and collaboration and speed to market enhanced, with SEDDI Author's collaborative, cloud-native platform. Additionally, the platform is so easy to use that anyone in an organization can leverage it—even sales teams that want to show customers accurate visualizations of final products in real-time.

Three cornerstones of any solution or ecosystem that aims to bring stakeholders together are ease of access, speed, and affordability. How has this influenced the way you price and deploy your solutions? What's your strategy to secure adoption throughout the value chain?

The three cornerstones you've mentioned—ease of access, speed, and affordability—are fundamental to the success of DPC and DPD technology and processes. With SEDDI Textura, we wanted the foundation of digital product creation and development to be accessible for brands and suppliers to work into their existing digital budgets, as well as to be highly interoperable to quickly ease that transition.

Brands and suppliers that are just delving into digital design and development, or simply want to test different solutions, can even use SEDDI Textura on a free plan. However, the real power of the platform is unlocked to help brands scale textile digitization and implement seamless collaborative workflows with value chain partners in our paid subscriptions, where we offer unlimited digitization. This model is far more cost effective than other solutions in the market, which upcharge for physics and require expensive hardware. All SEDDI Textura plans, even our free option, offer unlimited users to encourage wider digital product creation and development adoption across the industry.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

The ideal digital product creation and product development pipeline would take a holistic, end-to-end approach where stakeholders in different links of the chain can execute a common understanding of the design vision. Digital product creation conceives and visualizes the product and then seamlessly hands off to digital product development. Digital product development rapidly transforms the design concept into well engineered product meeting cost and calendar targets.

Brands need to understand where ROI comes from in the development process and demand technology solutions that deliver the return. Too often today 3D is seen as added work for the development teams. While there are good tools for digital product creation, robust solutions for digital product development are missing. Having the right end to end technology stack, with platforms that work with one another, are uncomplicated, and inexpensive for brands and suppliers to adopt, is crucial for success.

Additionally, the ideal pipeline should be accompanied by comprehensive training and education programs. It's essential to equip individuals and teams with the skills and knowledge needed to harness the technology effectively. This investment in human capital is a not-to-be overlooked piece of the puzzle to complete the vision of a digital first industry.

Style3D

HOME.STYLE3D.COM

Founded: 2015

PRICING MODEL:

Solution-based quotation

Style3D pioneers a cutting-edge digital fashion infrastructure, leveraging our self-developed simulation rendering engine and AI-driven 3D solutions. Our suite includes top-tier 3D design software, full-suite digital fabric sourcing solution, collaborative platforms, and digital asset management, ensuring an innovative approach from fabric digitization to final creation/marketing usage.

Since our establishment in 2015, Style3D has expanded globally. Our multinational teams comprise esteemed scientists, engineers, designers, and artists, serving a wide array of fashion brands, manufacturers, and fabric mills worldwide.

Our mission revolves around facilitating sustainable growth and transformation within the fashion industry. By providing state-of-the-art technology, we empower our partners to revolutionize their workflows, fostering efficiency and environmental responsibility.

HEADLINE CUSTOMERS:

Accademia DI Belle Arti Aldo Galli - BLOK MODA - COBALT - ESQUEL GROUP - Fashion-Enter Ltd - Great Escapes - Jadea - KLINGEL - Leverstyle - Luenthai - MAKALOT - MODART International - NEW WIDE GROUP - PROMAX - SAB - SHIMA SEIKI - The Hong Kong Polytechnic University - The University of Manchester - YKK

TOTAL NUMBER OF ACTIVE USERS WORLDWIDE:

8,000+ CLOUD USERS

19,000+ STUDIO USERS

300+ FABRIC MILLS DIGITIZED

1,000+ ODM ONBOARD

Style3D

HOME.STYLE3D.COM

Founded: 2015

15+ TECHNOLOGY PARTNERSHIPS, INCLUDING:

Alibaba.com - Alvanon - Baidu - BOK - COLORO - ET SYSTEM - Jeanologia - Nvidia - PANTONE - Renderbus - SAB - TMALL.com - YKK

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE DIGITAL PRODUCT CREATION JOURNEY?

At Style3D, our role in the Digital Product Creation (DPC) journey is to pioneer a holistic digital ecosystem that transcends traditional tools. We envision a seamless continuum from fabric digitization through design, internal collaboration, and downstream applications, streamlining the entire product creation process. This comprehensive approach enhances creativity through technology, ensuring each phase benefits from digital innovation, facilitating a more cohesive creative journey in the fashion industry.

CONTACT




Style3D



ERIC LIU

FOUNDER & CEO
STYLE3D

Our vision at Style3D is to forge a digital ecosystem that offers more than mere tools; it's about infusing fluidity into the fashion industry. Covering the entire spectrum of digital product creation means connecting various stages - from fabric digitization to design, and from internal collaboration to downstream applications. This holistic approach ensures seamless transitions and a richer, more cohesive creative process. Our commitment is to foster an environment where creativity is bolstered by technology, ensuring that each phase of product creation is enhanced by digital innovation.

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

In 2023/24, the most thrilling opportunity through investment in DPC, particularly AI, lies in its transformative power for the fashion industry. AI's role is pivotal in accelerating the pace of skill acquisition and production efficiency. The recent advancements in AI, like ChatGPT 4.0, with all those API integrations and App-Store like applications, highlight the actual potential for specialized AI-driven content creation and data modeling, tailored to specific industries. At Style3D, we envision integrating AGI for its speed and general knowledge with our unique industrial datasets. This synergy aims to culminate in a fashion-focused industrial model by 2024, revolutionizing how we approach design and production.

On top of the functionality you're directly offering or building, how important do you believe it's going to be for DPC to remain an open ecosystem? How do you think about your partnership strategy, and about the long-term future of integration and interoperability.



From your perspective, what does it mean to offer full process coverage across the spectrum of digital product creation - from fabric digitisation through design, development, internal collaboration and downstream use cases?



The concept of an open ecosystem is vital to the evolution and success of Digital Product Creation (DPC). At Style3D, we don't just acknowledge this we actively embody it in every aspect of our operations. Our strategy is grounded in the belief that a thriving DPC environment emerges from collaboration, openness, and a willingness to learn and adapt from various industry players.

Our partnership strategy is a reflection of this philosophy. Take, for example, our acquisition of Assyst GmbH. This move wasn't just a business expansion; it was a strategic step towards enhancing our digital capabilities, allowing for a seamless connection between 3D and 2D, from design to production. It represents a commitment to interoperability - ensuring our tools can integrate smoothly with existing systems and workflows.

Similarly, our partnership with Fashion - Enter Ltd., led by CEO Jenny Holloway, has been instrumental in expanding our global footprint. This collaboration isn't merely about showcasing our latest developments; it's about pioneering a fully digitized process, from design to production. Our joint innovation center serves as a testing ground for these concepts, demonstrating the practical application of our vision in a real-world setting.

Looking ahead, our strategy remains steadfastly focused on being open and adaptable within the digital fashion world. This means actively seeking partnerships that complement and enhance our capabilities, ensuring our tools and processes remain versatile and compatible with a range of platforms and systems. We believe that a truly functional DPC ecosystem can only be achieved through this kind of openness and collaboration, which fosters innovation and drives the industry forward.

In essence, our approach to DPC is to create a network of synergistic relationships that not only advance our capabilities but also contribute to the larger goal of transforming the fashion industry through digital innovation.

There's a lot of focus in this report about the right way to scale digital product creation to become an engine for enterprise-wide digital transformation, and one of the keys to unlocking that seems to be ensuring that users have the right level of trust in the tools and the assets that are available to them at every stage of the product lifecycle. How do you approach building that trust?

Trust in our tools and services is paramount. We achieve this through comprehensive pre-sales and post-sales support, ensuring a smooth transition for our clients. Our approach is consultative; we view feedback as an opportunity for co-growth. We also offer a robust knowledge center with 24/7 access to learning materials, tutorials, and webinars. This repository is supplemented by our experiences and lessons learned, shared openly with our clients. It's about creating a community where knowledge is accessible and collaboration is encouraged.



3D has long been seen as a creative catalyst - a way to shorten the distance between idea and visualisation - but that's a title that it might soon have to share with generative AI. Tell us how you're starting to bring those two things together, and how Style3D architects its approach to AI models and deployment.

In Style3D, our integration of 3D and generative AI is guided by a data-centric and iterative approach to fashion design. We understand that the essence of clothing creation lies in the iterative verification of designs, heavily reliant on data analysis. Our objective is to utilize Advanced Generative Intelligence Computing (AIGC) alongside 3D technology to lower entry barriers for enterprises and enrich the spectrum of design possibilities, from material selection to final production.

Our specific focus has been the development of a garment industry model tailored for AIGC applications. This model, underpinned by an extensive dataset, provides an in-depth understanding of the clothing industry. It represents a significant advancement over general AI models by generating outputs that are more aligned with the nuanced requirements of the fashion sector.

The practical application of this model allows for the input of existing garment styles, followed by the generation of multiple new design variations. This process not only accelerates the design cycle but also introduces a level of data-driven precision and innovation previously unattainable.

At Style3D, while embracing new technological frontiers, we maintain a commitment to our foundational goals. This pursuit is not just about technological adoption but also about contributing to the scientific discourse in digital fashion, enhancing both the creative and analytical aspects of the industry."

How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

The ideal 3D/DPC pipeline in fashion should smartly blend specific needs for different garment categories with a general framework that can be applied across the board. This approach would offer the best of both worlds: the precision required for particular fashion items and the efficiency of a standardized process.

The main challenges in creating and adopting this pipeline are technological limitations, especially in mimicking the intricate details of fabrics digitally. Integrating these digital tools into traditional workflows is another hurdle, as is the skills gap in the industry. Plus, the cost and complexity of these technologies can be daunting, particularly for smaller players.

To really bring this vision to life, we need better fabric simulation technologies for more lifelike digital garments. Making these tools seamlessly work with existing systems is crucial, as is training a new generation of designers who are fluent in both traditional and digital fashion creation. More affordable and user-friendly solutions would also help bring smaller brands on board. Finally, establishing industry standards would ensure consistency and quality, moving the whole industry forward together.

THREEDEEMEE

THREEDEEMEE.COM

Founded: 2015

PRICING MODEL:

Enterprise flexible licensing and commission.

We tailor our licence technology to each retailer and then each item that generates a sale, using our VTO, we take a commission.

The licensing fee is dependent on the retailer's size and market.

TDM Avatar API subscriptions will be offered at competitive rates and volume discounts will be offered to large enterprises.

THREEDEEMEE (TDM) is at the forefront of developing the next generation of fully automated scanning systems to produce digital measurement recommendations as well as a 3D twin/avatar. These avatars, known as TDM Avatars, can try on garments with garment physics to walk, twirl, and sit.

TDM Avatars represents a leap into the future as a solution to the online fashion retailers' problem of high returns by allowing customer's (end-user) to get a perfect fit and visual suitability.

What sets TDM Avatars apart is the realism from skin tone, body shape, hair colour and exact derived measurements. Our avatars are crafted, using nothing more than a customer's smart device and a 10 second selfie-video. This brings a true digital representation of the customer with identical body, facial, hair/eye features and enables realistic garment dynamics as the customers' avatar walks, poses and sits.

TDM Avatar technology will be open for all software developers and animation companies globally by API subscription, allowing the maximum number of clients to integrate TDM Avatar technology into their own website or gaming development.

VTO technology is currently estimated to reduce return rates by 20%. While we aim to increase this reduction with an enhanced technology that can bring visualisation to a more realistic and representative level; enhancing consumers' current e-commerce experience. While simultaneously increasing sales for retailers by 4-10%. Additionally TDM Avatar VTO aims to cut carbon emissions by reducing returns and addresses imminent sustainability regulations within the industry.

[With their official launch scheduled for early 2024, at this time THREEDEEMEE are unable to publicly disclose any customer names. They are welcoming new clients during this time.]

THREEDEEMEE

THREEDEEMEE.COM

Founded: 2015

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

TDM Avatars has a variety of use cases. Within the digital product creation journey we are currently targeting consumer facing issues at the end of the digital workflow, with our VTO technology for customer experiences and engagement. Specifically, addressing a key issue of fashion retailers which is product returns due to incorrect size, fit and visual suitability.

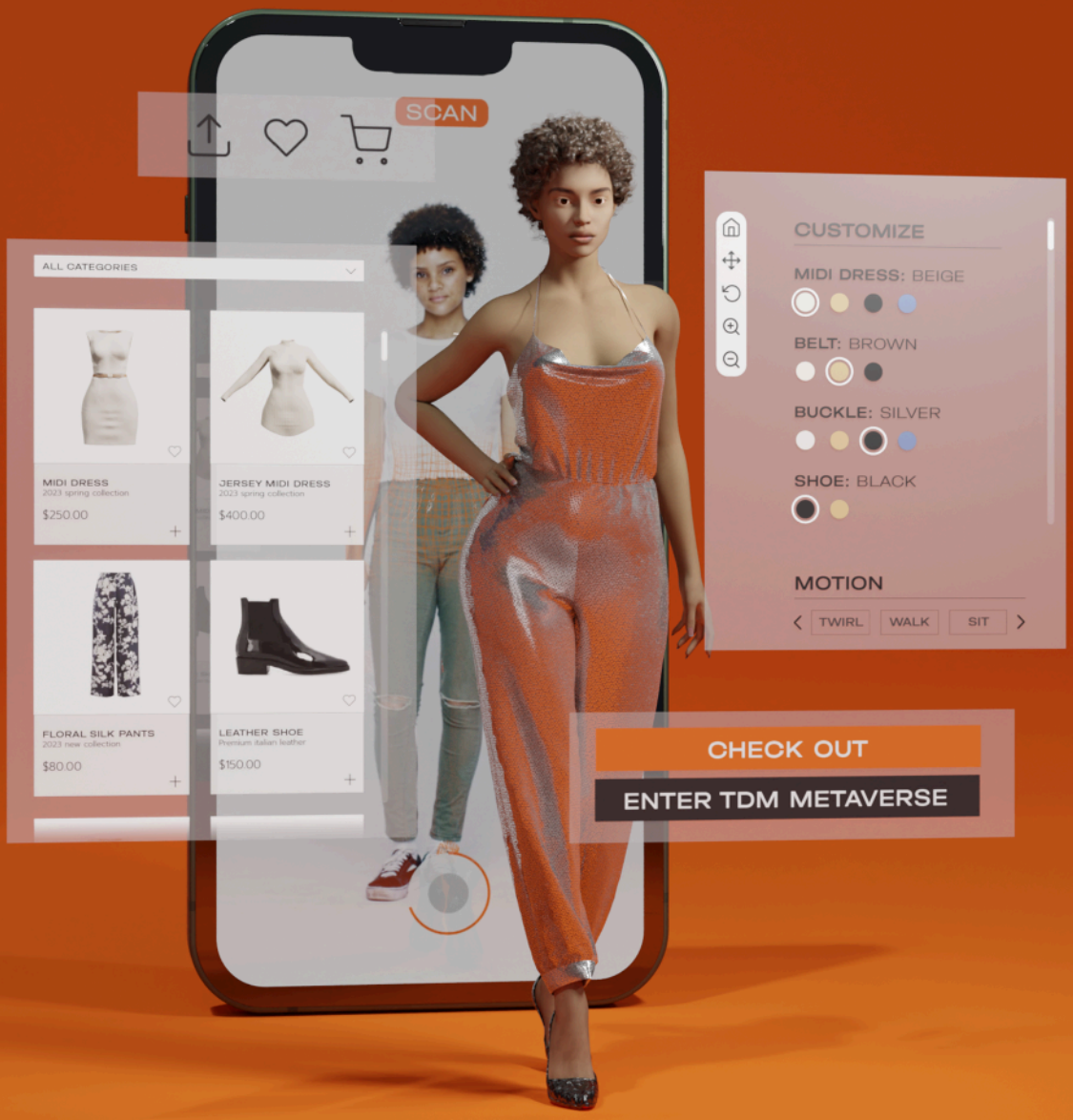
At TDM we have big plans on using our cutting-edge technology, our long term vision is to be the leaders of avatars in a person's own image. Our initial mission is a future where fashion fits all, empowering customers to shop with confidence and convenience in a new era of experiential shopping through VTO technology. We see TDM Avatars to be positioned for leading this technological advancement and address retailers specific pain points.

However, the use case for realistic avatars does not have to end there. For instance this can also be integrated into Metaverse and other aspects of web3 as the technology develops and users demand more accurate representation of their true self in virtual spaces. Moving away from current cartoon style avatars. We see 3D being a key driver in this area.

Therefore TDM's ripple in the DPC journey is to continue to innovate and develop VTO technology to include 3D technology in order to bridge the gap between the fitting room experiences and size recommendation tools currently available in the market today.

CONTACT

TRUE REPRESENTATION IN EVERY PIXEL



WEBSITE INSTAGRAM

THREEDEEMEE



MIKE MANNERING

CO-FOUNDER & CCO, THREEDEEMEE

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

Over the past few years intellectual and financial investment into DPC tools and talent have extended beyond integrating such concepts into educational institutions as the source for the next generation of talent. Now accessibility across teams is enabling more widespread implementation of DPC technologies for those working in the field, which allows for greater integration and cross team collaboration. Integrating these new tools into the supply chain and process however is still evolving, albeit, slowly. Early adopters are however becoming the rule, rather than just the expectation, which is fantastic to see.

The greatest opportunities now are to focus on how to make the DPC processes more automated and applicable to the goal of reducing costs, improving sustainability, and increasing brands' profit margins. With the use of technology, such as Artificial Intelligence (AI) and Machine Learning (ML), this really opens the door to these possibilities. Realistically what is achievable is the high rate of AI/ML technology adoption will be making DPC tools more applicable to achieve these goals quicker.

Your vision statement is to deliver a future where "fashion fits all". What does that mean from both an inclusivity perspective and from a practical angle? What do you see as the ideal future state for sizing and fit?

Incorrect sizing and fit has been an issue in fashion since the beginning. Brands currently struggle to produce a standardised cross-industry size guide. Brands that target ages 15-25 and those targeting 40-50 will have a different sizing based on average size demographics, and changing size standardisation is a massive cost. All bodies are created differently, and one standard fit is not consistent with the wide array of shapes and sizes in our society.

Different sizes and fit for different brands make it increasingly difficult for consumers to confidently purchase clothing online. Uncertainty of what size is correct in different brands, leads to "wardrobing", the act of purchasing multiple sizes of one product, knowing you plan on sending multiple items back. Research has suggested that 53% of consumers in the UK would be willing to try Virtual Try-On (VTO) technology while online shopping.

By capturing consumers' accurate body shapes and sizes with scanning measuring systems, the industry can understand the wide spectrum of shapes and sizes of their consumers in a more realistic manner. By receiving such data to improve size and fit, brands can align their specific size and fit to each customer of their consumer base, rather than generalising from target demographic and sizing charts.

A key goal in our technology development is to provide a reliable size and fit solution for brands with enhanced 3D VTO technology. TDM Avatars* are 3D digital twins that are realistic and articulated and can be dressed virtually with associated garment dynamics. Measurement accuracy is 1-2% in line with bespoke tailoring.



TDM Avatars* are a true digital representation of the customer with identical body, facial, skin/hair/eye colour and features and enables realistic garment suitability as the customer's avatar walks, poses, and sits, all with associated garment dynamics. This enhances consumers' current e-commerce experience with the ability to accurately see themselves when shopping online with a realistic digital avatar. As mentioned above, generating accurate size recommendations through precise body measurements that are directly linked to brands sizing charts, means fit and visualisation will be enhanced, reducing the need for "wardrobing" and the associated costly returns.

For ready to wear garments, we cannot fully eliminate the concept of standardised sizing, but we can offer an innovative solution for enhancing size recommendation/visualisation and building consumer confidence when shopping online. In short, a hope of a future where brands can provide sizes and fit that does indeed "fit all".

Virtual try-on is one of the most hotly-contested use cases for digital assets. What makes your approach different from the way other technology providers have tried to tackle the problems and the possibilities?

The competitive landscape for VTO technology can be split into three main categories. First, size recommendation applications. These applications do not provide a VTO experience or 3D product visualisation. The second is 2D VTO which uses two photographs to take key body marks creating a 3D model and 2D image overlays. These do not have any 3D movement or 3D visualisation of the product. The third and final category is avatar creators. These companies create avatars that are not currently used for fashion VTO but for pure gaming purposes, with an image of your face placed on already created body shapes. Obviously, these gaming avatars do not currently include accurate body dimensions or features.

What makes our approach different is bringing together three aspects, avatar creation, accurate size recommendation and garment physics. To our current knowledge TDM Avatars* bridges the gap between VTO experience and the physical fitting room. A realistic articulated avatar with a customers' exact measurements from a simple 10 second video, taken in the customer's home. TDM Avatars* allow for 3D avatar movement and realistic garment dynamics in any virtual environment.

TDM Avatars* is a solution that provides a more enhanced experience rather than 2D visualisation of products; creating the most realistic, fully automated avatar, that enables a customer to dress themself virtually and view themself online as if they were in a physical fitting room. It is a DPC technology offering that blurs the line between being in a physical store and shopping online. And therefore, a reduction of garment returns due to highly improved visualisation of the product in a dynamic and less static manner. Consumers can view themselves on their screens when shopping online as if they were physically trying on a brand's garments and viewing themselves in a store's fitting room. Such experiences can also be shared with whomever the customer desires. Bringing DPC technology to the e-commerce experience enabling a highly personalised experience.

Your goal is to deploy technology to make returns a thing of the past. Tell us how big of a hit returns currently have on brands' and retailers' bottom lines, what kind of environmental impact they're responsible for, and what you believe technology can do to mitigate and eventually eliminate those.

TDM Avatars* aims to be the solution that reduces retailers' current returns rate and, in the future, make returns a thing of the past.

Currently over 40% of shoppers expect to return at least one item when online shopping with 66% of those consumers citing incorrect fit as the main reason. The main challenge is addressing incorrect sizing, with most customers relying on self-measurement for most size recommendations. In addition, e-commerce's current limitation is the 2D visualisation of products. Not allowing for customers to visualise what a garment will actually look like on them when purchasing clothing online.



Getting garments returned from customers and back into a retailer's inventory is a case of reverse logistics which is both costly and environmentally damaging. Retailers must consider transportation, processing, and customer care during the returns process, resulting in the creation of a costly reverse transportation chain, doubling emissions. Returns require fault checks, cleaning, restocking in the warehouse and associated employee time. Often this process is uneconomical, and items returned are thus frequently sent to landfills, or are incinerated.

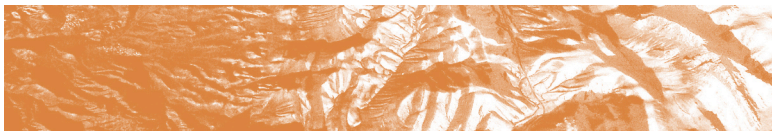
The cost of processing returns began to rise in 2020 as the pandemic accelerated e-commerce trends. Also, geopolitical crises since have caused fuel prices to rise, increasing transportation costs. With the value of UK clothing and footwear returns likely to reach £4.4B in 2026, the returns issue is likely to impact retailers' EBIT margins by at least 3% points. Retailers suffer approximately US$ 166M in returns for every 1 US$B in sales. Optoro stated that the total cost of every apparel returned to cost the retailer between US$19.25-US$49.50. Due to this high cost retailers must find a solution to reduce the amount of returns they are facing, which were once considered a given cost to endure. In 2023, the average cost per item for retailers to procure and process returns rose 22 percent year on year to US$33, according to a study from returns software firm Narvar.

While economically costly, the environmental impact is staggering and is an issue that is not uniformly recognized yet by consumers. Optoro estimates returns generate 15 million metric tons of CO2 emissions, with 50% of returned garments not being restocked. In 2022, in the UK alone, the returns process produced 750,000 tonnes of CO2 emissions. With returns causing 5 times as much CO2 as the original purchase. Due to the economic cost of restocking returned items, retailers end up sending stock to landfills. The British fashion council highlighted that 23 million items of returned fashion were sent to landfill or incinerated in the UK in 2022.

VTO technology that is currently available can reduce return rates by 20%. We believe at THREEDEEMEE* our technology, TDM Avatars* can be a solution that enhances this reduction and increases sales by providing a VTO solution that gives a realistic visualisation of a garment on a digital twin of the customer using the customer's exact derived body measurements. Therefore, providing a more accurate size recommendation. TDM Avatars* are a solution to the two main causes of returning a garment. Incorrect size and fit as well as poor visualisation of the colour and style of the garment and what that will look like on your skin tone, body shape and hair colour when shopping online.

Moreover, our goal is to aid fashion retailers in measuring their return rate and impact on sustainability goals as required by imminent EU legislation. Our technology provides the data that brands currently lack, in order to understand their environmental impact with a reduction in returned goods.

TDM Avatars* is disruptive as it differs from competitors that lack the interactivity and immersion and allows for full 3D avatar movement in any virtual environment, bridging the gap between size recommendations and VTO experiences. Now is the perfect time for an enhanced offering because retailers are embracing work process digitisation and struggling with the cost of returns, opening the opportunity for enhanced VTO. Gap and Zolando are trialling and experimenting with VTO technology into their e-commerce platforms. Therefore, we are seeing a shift in what larger retailers are searching for in technology for their online stores as well as customers' desire to see themselves realistically in online environments.



How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

Previously, tools and access to 3D design was a key barrier as it was complicated, and few understood how to use the digital tools available. As things progress and these tools become easier to integrate and education in 3D design grows at leading universities, these barriers are disappearing. However, the view that 3D or DPC has limited use is still a barrier for some elements of the garment value chain. While this impression is slowly shifting, progress is slow and fragmented throughout the entire design, sourcing, manufacturing, marketing and sales processes.

Digital and 3D design, encompassed in a digital technical file, can be utilised throughout the product journey, across teams and departments. Once the hurdle of adoption is tackled at the initial stage, the use of these digital assets will be fully realised across the value and supply chain.

Realistically, further financial investment into 3D/DPC departments is still needed. Some brands have full teams built for this integration, which takes significant time and investment on their part. However further financial investment is required beyond awareness and education for the use of 3D assets, and to take these concepts beyond just design teams' benefits. A restructuring of how fashion views their processes and how products are brought to market is still needed. Hence, while it is coming, further investment will be needed to achieve a full-scale vision of DPC.

Specifically, only when investment is across departments (e.g., research, design, sourcing, manufacturing, marketing, sales and customer facing experiences etc.) and not only in one section of the product journey, will the industry be able to enjoy the full value that 3D design holds. Moreover, further investment into these technologies are needed to increase accessibility even further. Automation will accelerate this, such as automated 3D digital assets through AI and ML. As larger brands continue to implement DPC strategies we will start to see more alignment and a clearer vision for full value chain DPC deployment. Which, here at THREEDEEMEE* we are excited to see. Moreover, as the use of avatars become more integrated into marketing and sales processes, they can move further up or down the supply chain covering more processes than just during the first steps in the design process or the last process of sales with VTO applications.

When we talk about avatars, we're simultaneously talking about both a digital substitute for real, physical fitting and try-on applications, but also the base for dressing in a range of potential real-time experiences. What do you think about avatars that can transcend channels? Is this a route to bringing digital and physical closer together?

Our team at THREEDEEMEE* firmly believes that the future is progressing towards being phygital.

Our technology, TDM Avatars*, initially focuses on VTO capabilities, introducing digital twins into the realm of fashion e-commerce. However, TDM Avatars* are not limited to this purpose alone. They extend their





functionality to all virtual environments, whether it's virtual fashion shows, immersive fashion experiences, virtual meetings—be it for business or social purposes—where customers seek realistic avatars that authentically represent their appearance or desired image in virtual spaces.

As our lives increasingly transcend the confines of the physical world, the importance of digital identities continues to ascend. Just as we carefully craft our identities in the physical realm, we are seeking tools and services to mould our digital identities. At THREEDEEMEE*, we recognize the parallels between virtual worlds and the societal norms and behaviours of the physical world. With younger generations placing more emphasis on their digital personas and possessions, sometimes even above their physical counterparts, it raises the intriguing prospect that the boundaries between the digital and physical realms will eventually merge into a singular ecosystem.

With this in mind, the options are endless.

**Trademark Registration Pending.*

THREEDEEMEE.COM

VIZOO

WWW.VIZOO3D.COM

Founded: 2013

PRICING MODEL:

The xTex scanner hardware is a one-time purchase. xTex Software licenses as well as the physX platform is provided on a 12 month per user subscription basis.

Material Services are charged per scan. High volume discounts available on request.

The Germany-based company Vizoo is the number one supplier of solutions for industrial digitization of materials.

Since 2013, the company helps fashion brands, manufacturers, and fabric mills to create digital twins of their physical samples and digitize their material processes.

Vizoo products are made with the objective to create realistic digital materials in no time. Clients appreciate the ease-of-use and the consistent output, which makes xTex the technology of choice when it comes to mass production of digital materials.

In more than 45 countries globally, fashion, interior and automotive clients are using Vizoo technologies to feed their 3D Design, virtual prototyping, marketing, or eCommerce applications.

Our offering:

- The xTex scanner to accurately capture the visual surface of the material (PBR textures).
- The xTex software to provide intuitive tools, even for non-3D experts, to process the materials (tiling, recolouring, rendering) and to generate output compatible with any 3D tool.
- The physX platform assigns the mechanical parameters needed for 3D apparel simulation.
- Physical reference geometries for validation of digital twins.

In addition, leveraging their industry expertise Vizoo consults brands and suppliers alike to digitize their material supply chains, in order to expedite the brand's digital product creation process.

HEADLINE CUSTOMERS:

Adidas - Artistic Milliners - Avery Dennison - BMW - Delta Galil - GAP - J.Crew - H&M - Holy Fashion Group - Hugo Boss - IB Company - Keen Footwear - Li & Fung - Marks & Spencer - MAS Holdings - Nike - OTB Group - Otto Group - Puma - PVH - Ralph Lauren - s.Oliver - Salomon - Target - Under Armour - VF - W.L. Gore

1,000 TOTAL NUMBER OF ACTIVE LICENSE KEYS WORLDWIDE, ACROSS THE FOLLOWING REGIONS:

22% NORTH AMERICA **40%** EMEA

1% LATAM **37%** APAC

VIZOO

WWW.VIZOO3D.COM

Founded: 2013

25+ TECHNOLOGY PARTNERSHIPS, INCLUDING:

Adobe Substance - Assyst - Atom Shoemaster - Audaces - Bamboo Rose - BeProduct - Blender - Browzwear - caddon - Centric PLM - Clo3D - ClothingTech - DMIx - embodee - Emersya - Jeanologia - Keyshot - Metis - Optitex - Performance days - Stitch Design Hub - Swatchbook - Trapdoor Creative - Virtuality.Fashion - weev.one - Z-emotion

WHAT ROLE DO YOU SEE YOURSELF PLAYING IN THE 'DIGITAL PRODUCT CREATION' JOURNEY?

The foundation for a digital product creation workflow are high-end material libraries. This is an area which is initially often overlooked, and many companies regret to not have started building this basis for their DPC process first.

Materials, Fabrics and Trims have to be readily available in 3D to have a positive user experience in the Design workflow. If users have to stop their creative process because not all assets are available, it will delay results and cause frustration. Not to mention that 3D is perceived as too time consuming.
Looking further down the creation process, 3D prototypes look much more realistic resulting in a wider acceptance internally and allowing for more accurate decision for approval or changes.
Last, high-quality assets allow customers to streamline their process all the way to ecommerce, instead of creating a quality barrier for any customer-facing use cases.

In addition, Vizoo works closely with fashion clients in scaling the creation of digital assets by bringing the digitization effort closer to source. This happens by onboarding fabric mills to do their own scanning but also by establishing certified scanning service hubs all around the world.

In short, 3D – being an entirely visual approach to product creation – is very dependent on quality. The more realistic the materials, the more likely it is for 3D to be accepted. Additionally, only a scaled process can bring the significant speed gain and will result in expected ROI.

CONTACT

VIZOO

Material Digitization Solutions for Stunning **Digital Twins**



Visit www.vizoo3d.com and start digitizing your business today.



RENATE EDER

CHIEF COMMERCIAL OFFICER, VIZOO

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

In the current economic downturn, many companies are reverting to traditional processes due to budget cuts. However, some recognize the necessity for change in these critical times. Major brands are actively transitioning to a digital supply chain to enhance value through their DPC workshops.

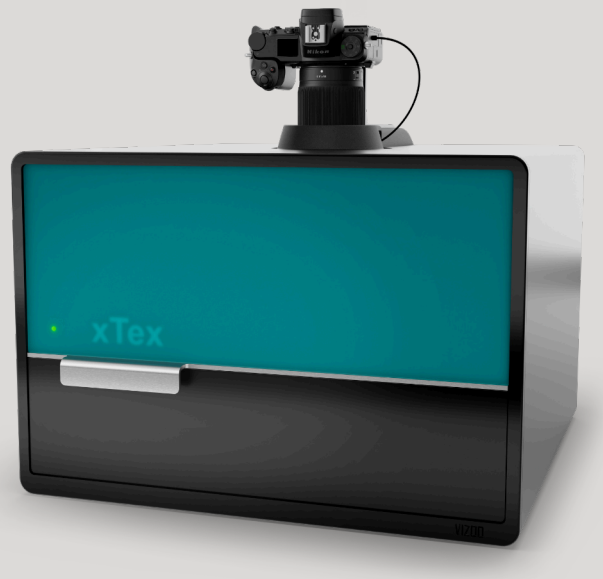
Amid economic challenges, this year presents a fantastic opportunity to closely examine the utilization of 3D processes and how companies can eventually reduce costs. Rather than aiming for a vision 5-10 years ahead, companies can apply 3D solutions today. Probably the biggest investment here lies in experts who are both intimately familiar with Fashion processes as well as 3D tools and capabilities to identify areas where cost can be saved using 3D.

For digital product creation - and wider digital transformation - to really take hold, it needs to become deeply integrated into the supply chain, and brands and their upstream partners will need to decide on how the workload of digitisation is managed. As a technology supplier, you're right in the middle of that conversation, so what's your take on how that supply chain integration is progressing?

There is no doubt that digitization must happen at or close to source.

Many brands complain that vendors are adopting technology too slowly and that the return on investment (ROI) is not meeting expectations. However, upon closer examination, we can identify an underlying issue. A very dominant problem is the lack of brand commitment to request fewer physical samples. Thus, most of the time 3D stays an "add-on", and unfortunately the traditional processes stay untouched.

Another unobvious issue is that some brands just do not know which vendors digitize. Therefore, Vizoo started to provide a supplier listing to our brand clients to have more transparency on onboarded T1 and T2.



The silver lining: in 2023 we sold most of our technology to manufacturers and mills. They are either getting equipped through a brand request or, do want to get ahead of the game and invest for their own business case. Forster Rohner (Switzerland), JML and MAS Holdings are perfect role models how suppliers are pushing the brands to digitize. Digital materials are in fact a perfect example for an integrated digital supply chain. The beauty is that the ROI sits on multiple ends.



A lot of brands are working to diversify their sourcing bases, which means that materials (and by extension digital materials) are coming from a wider range of sources. That could raise some concerns when digitisation capabilities are so unevenly distributed across the value chain, so how do you think about quality control and setting standards for the fidelity of material capture?

The discussion of quality is becoming a very frequent one amongst our clients and it shows us how digitization is taken so much more seriously than a couple of years ago. Having said that, outsourcing always requires clear communication, processes, and quality standards.

Brands scaling DPC experience that precisely communicated quality expectations and guidelines are a foundation of a successful working relationship in the digital space.

At Vizoo we have introduced easy-to-use assessment tools which help to judge the drape and overall appearance of a fabric. These are already successfully utilized by several brands and vendors. Moreover, we will provide a similar approach to assess quality and other visual aspects like reflection and transparency in 2024.

All those tools are focused on efficiency, to avoid putting any more extensive workflows on the vendors shoulders.

There are, of course, conflicting opinions on where material libraries - both physical and digital - should reside, whether it's in PLM, a dedicated digital materials platform, or something homegrown. How do you work to make sure that materials can be easily used once they're digitised, instead of ending up in data silos?

I do not believe that we will have this single global platform of digital materials. Currently, there are multiple approaches, either from platform providers or even self-developed solutions from brands and vendors. Our client JML offers their full material base on their own digital library for example, but we also do have many clients relying on swatchbook and similar tools. Another approach is a digital fabric fairs like the performance days who is grouping all their exhibitors offering on their digital fair platform.

This topic will still develop. However, to date I do not see this as a showstopper going digital.

The only two crucial points for companies in this phase are to choose a solid and ideally open-source format for their materials, like U3M, and to make sure that whatever platform they utilize it has an API and can be accessed using tools like REST API. This way they do not end up with a dead or closed-off format and can always migrate 3d materials to a new library if necessary.

At a more foundational level, why do you believe accurate digital materials are so important to the strategic objectives of fashion brands today? And how does that translate into a mandate for capturing those materials to the highest possible standard?

A lot of brands are incredibly detail-oriented when assessing their 3D images – most of the time far beyond their needs. I do believe that it is important to define the use case of the assets first, and then to specify the quality which is needed to achieve this.





Nevertheless, bad material quality is one of the most common reasons when companies are not convinced of 3D. It is a significant risk for DPC to fail in the POC (proof of concept) phase if the final renderings look like a video game graphic from the 90ies instead of a photo-realistic image. German fashion brand s.Oliver point out in our joint case study that only with Vizoo materials they drastically raised the internal acceptance for 3D assets.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

A physical fabric swatch is displayed at a brands supplier meeting or fabric trade show. Through QR codes designers can access the 3D material of said fabric and use the data right away for their ideation in 3D. Fabric selection happens completely digitally. Only then, a selected small set of physical fabrics can be ordered.

The original 3D material is of such a quality that the brand can use the assets directly for their internal database and communication, Design, Prototyping, Fitting and up to eCommerce and other consumer facing tools – all can happen with little support from the physical side.

Communication with manufacturers happens completely in 3D with very limited sets of physical samples.

And this is not even a far and remote vision: with the tools and technology available all this is possible today. The barriers are:

- Transitioning to the new processes. Fashion employees are always busy, work 110% and barely have time to fulfil existing deadlines. This makes the interim phase of training new digital processes and implementing them extremely difficult. Also, we are talking about processes that have been in place for decades already so naturally people are hesitant to adapt to new procedures.
- Convincing leadership and other departments. I often see that 3D teams are its very own tiny, isolated island within companies and have a difficult time convincing departments like Design, Marketing, Sales to embrace 3D but also struggle with communicating the benefits to their leaders and even C-Level management. Without support from all 3D has a tough time.

We need to continue our collaboration with universities to have more Fashion people with the required skillset already available to go digital, but we also need to market & communicate the benefits more, both internally in a company and externally. Employees need to be encouraged to deliver benefits for the entire value chain, instead of only their siloed department benefits. 3D needs to "burst" its bubble and become the mainstream tool for the Fashion industry.



whichPLM

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Founded: 2007

WHICH DPC SUPPLIERS DO YOU WORK WITH?

WhichPLM Advisory supports the majority of DPC solution providers as an expert on broader best-practice digital workflows. We help brands and retailers looking for new tools and process introductions and education related to best-practices, and how to obtain proof of value relating to the extended 3D-DPC ecosystem.

We occasionally work with DPC vendors, auditing their solution maturity, and helping them to look beyond their own workflows advancing their value by joining processes with extended eco-system partners.

Having been involved in 3D-DPC since 1985 (footwear) and 1999 (apparel), we have spent decades analysing the vendors operating within the DPC space.

During this time we have scoped and even implemented various 3D solutions. We have carried out audits on 3D apparel solutions, so we truly understand the DPC ecosystems.

In the last twelve months, we continue to push the boundaries of 3D-DPC by helping to develop new Ai-gen models for both Apparel and Footwear brands.

HEADLINE CUSTOMERS:

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STRATEGIC SERVICES:

- Education on Extended Workflow
- Solution Scoping
- POV (Proof of Value)
- Workflow & Best-Practices
- Process Maturity Audits
- Vendor Workflow Support
- Technologies & Value Creation
- Support on DPC modelling
- AI Automation

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DPC PROCESS AREAS COVERED:

- Trend Analysis
- Inspiration & Concept
- 2D Creative Design & CAD/CAM
- Adobe Cloud Suite
- BodyAnalysis, Materilas & Component Scanning
- 3D Authoring Solutions
- Digital Materials
- Digital Printing
- DPC Development Workflow
- Digital Colour Management
- Digital Asset Libraries
- DPC AI-modelling

HOW DO YOU DEFINE 'DIGITAL PRODUCT CREATION' FOR FASHION - ESPECIALLY AS IT ENTERS A PHASE OF SCALE. INDUSTRIALISATION. AND WIDE-OPEN POSSIBILITIES ?

Digital Product Creation (DPC) in the Apparel and Footwear industry allows companies to conceptualise, develop, produce, and sell products in a virtual, collaborative environment.

DPC is helping transform the RFA (retailer, apparel & footwear) sector, enhancing the product & customer experiences, both downstream and upstream, via the introduction of seamless workflows, and creating new Ai-models that are generating new value streams. The values include reduced impact on the environment, speed to market, efficiency gains, reduced costs, increased margins, enhanced sustainability and impact analysis prior to physical development.

DPC is accelerating at speed partially driven via Ai automations, and new gen-Apps.

There are numerous solutions and processes in the DPC-ecosystem that need to be 'seamlessly' connected to help create a a smooth end-to-end efficient workflow.

CONTACT

ADVISORY SERVICES

whichPLM



With close to 49 years of experience in fashion design, manufacturing & information technology, Mark Harrop of WhichPLM is a digital transformation expert advisor & process futurist supporting brands, technology businesses & fashion technology start-ups.

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MARK HARROP

FOUNDER & CEO, WHICHPLM ADVISORY

What do you believe are the greatest opportunities that are realistically achievable, in 2023/24, through investment in DPC talent and tools?

This year and beyond, I expect to see brand and retail businesses continuing to build out their DPC ecosystems by investing in solutions, training, talent, and integrations - all with the ambition of getting a little bit closer to the vision for a digital twin of product and process. But the biggest advances in the next twelve months are going to come from the use of generative AI to automate and accelerate workflows across those extended ecosystems. We are already seeing the impact of generative models in other creative sectors, and fashion will be no different.

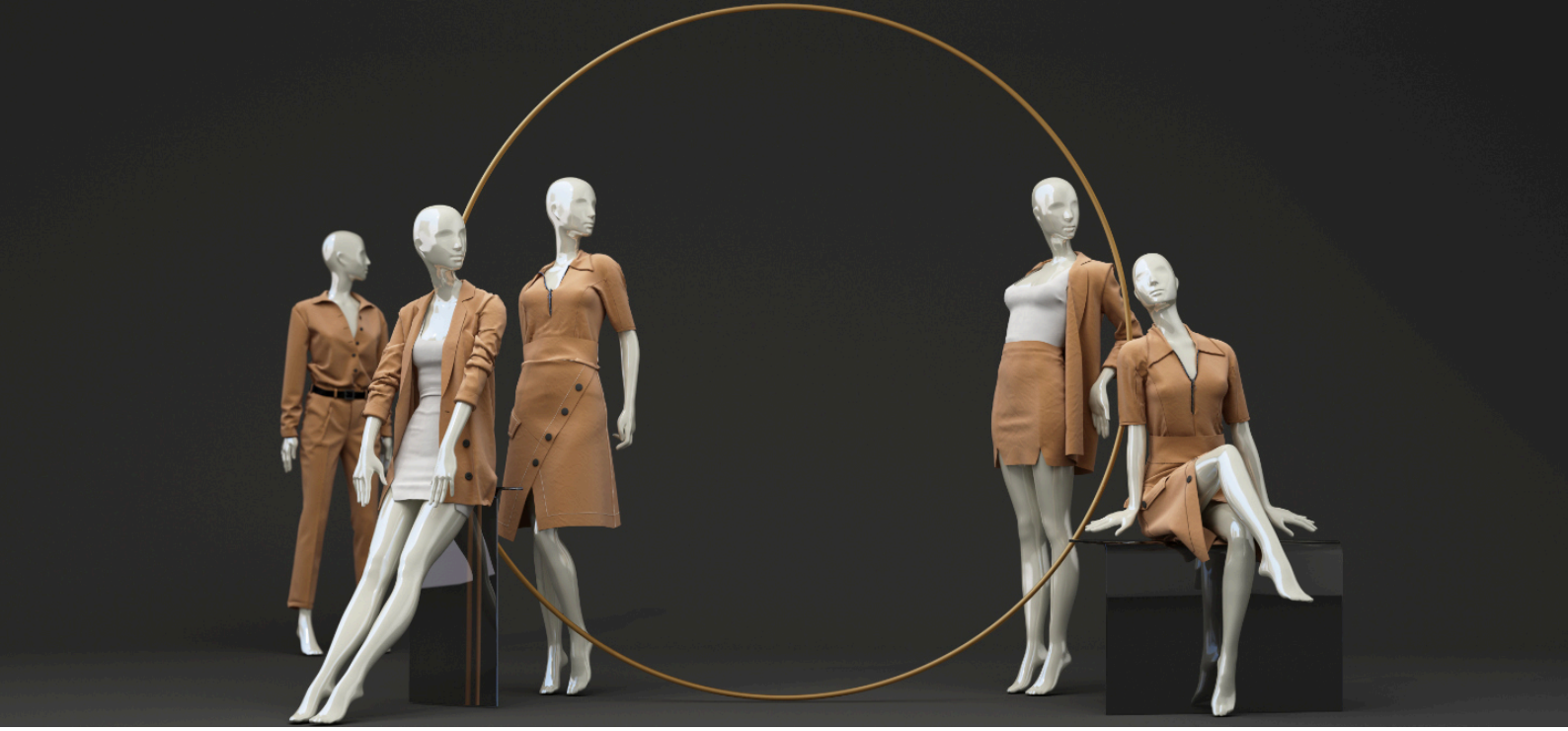
It's interesting to see the extent to which DPC and AI strategies are starting to converge. What are some genuine use cases where the two strands cross over?

Beyond what we've already seen with off-the-shelf models, brands are already beginning to either train existing generative models or build entirely new ones using their own trend and design DNA as the foundations. The objective here is to enable their creative teams to quickly bring new materials, new product styles, new colourways, and new options to life in a way that's on-brand and that avoids the persistent problem of consumer-facing models being trained on datasets from multiple different brands. This kind of bespoke text-to-image output will potentially cut ideation times down to a matter of minutes.

We're also already seeing the use of AI in capturing the world - whether it's body / foot scanning, or digitising full products and environments. I'm aware of several AI applications that have the potential to rapidly expand on brands' and retailers' DPC footprints by enabling them to more quickly and easily capture parts of the real world.

We're talking about a fully next-level DPC ecosystem here. What do you see as being the major barriers, at the infrastructure level, to delivering it?

A truly all-encompassing DPC ecosystem will generate a huge amount of data and consume a mammoth amount of compute when we consider all the different point solutions and the multiple lanes of digitisation that need to merge to create a complete workflow. And that's before we introduce AI - both within the individual processes themselves, and at the oversight and orchestration level where it needs to work with a mix of structured and unstructured data.
AI models currently require a tremendous amount of compute, which is largely done in the cloud. But the near future is going to be defined by different tiers of models that can run locally, in general data centres, and in specialised AI clusters. That infrastructure is still very much being built out, and it's likely to become a barrier sooner, not later.



There's a lot of focus on individual process areas in this report, because the current level of DPC maturity is still heavily geared around individual tasks and manual work. How do you see automation developing over the next couple of years, and what DPC process areas will it touch first?

There is no technical reason why we can't continue to accelerate the end-to-end design to product development process - in both areas where it's already touched by DPC, and areas where DPC tools and workflows are only just beginning to have an impact.

The fashion industry's focus should be on deploying generative AI-powered applications, that share common LLM datasets, to automate mundane, time-consuming tasks that do not add value to the finished product. There are many of these manual tasks, from data collection and entry to scanning, file organisation and colour-switching, that are prevalent across trend analysis, storyboarding, stitching, patternmaking and many other areas. The objective of this kind of automation is not to take over these activities, but to remove the manual, non-productive work that people currently undertake.

What's the likelihood that DPC and DPC-adjacent jobs will be lost to this kind of automation?

Over the next couple of years, I believe fashion is going to face a steep learning curve when it comes to understanding and capitalising on the opportunities that are presented by holistic automation in DPC. This is not a key that's going to be turned quickly or easily, and I don't expect that it's going to lead to job displacements any time soon.

What I do see, though, are teams becoming much more efficient as DPC automation is rolled out, which will raise some deep organisational questions about where people's talents are best deployed, and how to make use of them to create new opportunities and greater choice for consumers.

I can see designers adopting AI copilots as design assistants to help augment their creativity, and I expect that their jobs - and the roles and responsibilities of the wider creative teams - to change as they have the opportunity to learn new skills, improve the way their designs are created and tagged so that they become a more seamless part of the post-design pipeline, and push their creative frontiers even further.

How would you describe the ideal 3D / DPC pipeline - category-specific or generalised - and what barriers are currently preventing it from being built and widely adopted? What pieces still need to be put in place for fashion to stand the best chance of achieving what you define as the full-scale vision for DPC?

A truly future-ready DPC pipeline needs to be highly flexible, category-agnostic, and it should make use of shared, smart (LLM) datasets. To help realise this, we need to concentrate on creating seamless integrations across existing technologies and processes, to enable frictionless collaborative creation that unifies planners, data scientists, designers, 3D artists, material and colour technical experts and many more - all in a single share ecosystem with an intuitive UI/UX, built on a powerful new IT infrastructure.



DPC MARKET ANALYSIS 2023/24

HOW GREATER VISIBILITY, EXTENDED FUNCTIONAL FOOTPRINTS, CONTINUED COLLABORATION, AND ONGOING INVESTMENT AGAINST A DIFFICULT ECONOMIC BACKDROP ALL CONTRIBUTED TO A CLEARER PICTURE OF THE SIZE, SHAPE, AND SCOPE OF THE TECHNOLOGY MARKET FOR 3D AND DIGITAL PRODUCT CREATION.

INTRODUCTION & EXECUTIVE SUMMARY

Last year, in our first-ever DPC Report, we gathered baseline market statistics to begin the task of quantifying and documenting the growth of digital product creation as an independent technology category. That early stage analysis added weight and evidence to a feeling that many of our readers already had: that DPC was much more than just an offshoot or a small corner of the technology ecosystem for fashion, and that it should be considered as equal in scale and importance to other big enterprise software segments.

In that 2022 market analysis, we erred very much on the side of caution. We examined a carefully ringfenced set of software revenue in isolation, excluded revenue derived from services, implementations, consulting, and bureau / agency work, and focused on the core of licensing and subscriptions as the strongest indicator of the sector's growth to date, and its foundations for the future. And with actual brand and retailer process maturity already well-analysed by the team at Kalypso (who we have worked with several times to analyse and extrapolate from their annual findings, and who also appear in this report) we confined ourselves to assessing the DPC market for fashion by looking exclusively at the technology landscape.

This year's analysis confirms that a conservative approach in 2022 was the correct choice, since it provided the broad outlines of a picture that we are now able to paint in greater (but certainly not complete) detail, and since it provided a realistic benchmark to build a deeper, multi-year analysis on top of.

The temptation, with any technology that a sudden tipping point of capability and adoption, is to be overly enthusiastic and fall into blind hype, but in those cases pragmatism is the right attitude - because any organisation investing in DPC is going to very quickly encounter the reality, and The Interline would always prefer to stand closer to realism than to possibility.

That being said, after adopting an even more conservative stance this year - in service of arriving at the most reliable conclusions possible - we discovered many more reasons for optimism than pessimism, and we are confident in raising our market sizing estimate for DPC software licensing upwards from "at least $40 million" in annual recurring revenue (ARR), to between $51 million and $105 million when quantified on the same basis. This increase - and the rationale behind our having two different estimates based on upper and lower bounds of average pricing - is examined in detail in this final section of the DPC Report 2023, but we wish to note that actually we consider both estimates to be on the conservative end of the possibility spectrum, even without expanding the scope of this analysis to include non-software revenue.

(For a non-identical comparison, the global PLM market for fashion achieved around $40 million in new software licensing business in the fiscal year 2022/23, although ARR across the entire PLM install base will be much higher.)

In terms of overall approach, our methods remained broadly similar this year. We confined our analysis to the ringfenced pool of technology vendors who took part in this report and last year's counterpart, and who provided us with some measure of their sales and user data. In some cases we then pared these figures back by as much as a third or a half, since non-brand users (i.e. students, freelancers and others that we consider to be non-commercial licences) are sometimes conflated with commercial users.

We then blended this direct information with our wider industry knowledge (gathered from conversations that have taken place with technology vendors and brands throughout this year, fully aggregated and anonymised) to synthesise the most complete picture to date of the DPC technology market for fashion - covering footwear, apparel, and accessories.

The primary difference, then, was not one of method. Instead, we have been able to revise our estimates upwards due to having a wider pool of industry data to draw on, and because the technology vendors that cater to this growing market segment are now placing greater trust in this process, and providing more access to their sales data than at any point in the past.

It is important to note, when considering the figures, the conclusions, and the inferences drawn in this analysis, that we are not - at least not in this year's Report - tracking DPC sales year-on-year. The data we captured did not correspond to net-new sales in 2023, and instead our work with this analysis was to continue piecing together a progressively clearer picture of the current total install base for 3D and DPC tools in fashion. In future years, we may then look at charting annual trends, but for the time being this analysis is focused on depicting the market to date.

And in summary, that install base remains strong and is actively growing. If there is a key takeaway from this report, our largest and fullest to date, it should be this: DPC is still in the ascendancy. Even in the face of a problematic economic outlook, and a growing unease among brands and retailers to "invest their way out of a crisis," DPC adoption remains on the rise, and the more data our analysis team has been able to uncover about the composition of the DPC market, the more positive the outlook becomes.

For the different audiences who read these Reports, this is almost unqualified good news. Brands, retailers, suppliers, and other end users, can be confident that there are one or more solutions that will fit their needs - and that the best-known technology vendors in this space are likely to remain stable partnership prospects for the foreseeable future. Investors looking for an area of fashion to fund new innovations in need look no further than DPC (and sustainability, as documented in our Sustainability Report 2023, published this summer). And technology vendors have a gigantic pool of prospective customers to sell both proven and disruptive solutions to.



DEFINING THE DIGITAL PRODUCT CREATION LANDSCAPE

As we covered in last year's market analysis, digital product creation is a catch-all term that encompasses a lot of distinct solutions and categories. The thing that each of these have in common is that they contribute to, or make use of, digital representations of physical products at one or more stages of their lifecycles - as well as digital-only products in some cases. Under that umbrella are, as we pointed out in 2022, solutions for everything from "the hands-on mechanics of manufacturing to the newest frontiers of marketing". This diversity has certainly not changed in the intervening twelve months.

Taken together, these different solutions - a spotlight list of which you can find in the "Key Players" section of this document, with vendors in common between this year's report and last year's, as well as plenty of new faces - make up a wide ecosystem where competition and collaboration are thriving. Within each lane of the DPC highway, prospective customers will likely find several viable solutions that are distinguished from another by functionality, but also by the extent to which they integrate with the wide array of solutions that occupy those other lanes.

While those lanes are becoming better delineated, though, the last year has not made it any easier to conduct apples-to-apples comparisons at the whole-category level. Customers can, of course, contrast core 3D design and simulation tools against one another, but there is no one, codified DPC-wide segment within which it's possible to name a dominant player. And although the functional footprint and process coverage of the biggest and best-established platforms has expanded - pushing into fabric digitisation, cloud collaboration, digital asset management and more - no single solution can be said to have anything approaching full process coverage.

This is also something that the vendors who make up the technology landscape for DPC recognise. Every company listed in the "key players" section of this report - along with many technology vendors who are not featured this year - places a significant emphasis on partnerships and integrations, rather than proprietary lock-ins. The various common cogs that comprise the foundations of the DPC ecosystem, across 3D design, simulation, digital materials, and real-time and offline rendering appear on many of these partnership lists, but we also see smaller and newer companies treating integration and interoperability as the standard - meaning that integrations are not just confined to the established 'infrastructure' platforms.

Interestingly, last year our team also had a lengthy debate about the name of this report. There was a very real fear, internally, about whether enough of the audience would understand what the acronym "DPC" stood for - even though it is certainly not one that we created, and it has been in circulation within the industry for a while. And at that time this was a valid question to ask, since many DPC strategies in 2021 and 2022 were still compartmentalised as being design and development initiatives, where the "3D" label is normally used.

For the avoidance of doubt, The Interline considers 3D design, simulation, and rendering to be one subset of the wider DPC ecosystem. And the last twelve months have demonstrated that this view is widespread; after reaching more than 4,000 readers with last year's DPC Report - none of whom approached us to question the definition - we have observed that the acronym has become accepted shorthand in the worlds of footwear and apparel for the full scope of digital design, development, production, sales, marketing and more.



RETURN ON INVESTMENT IN A DIFFICULT ECONOMIC CLIMATE

In our 2022 market analysis, we wrote that the tipping point of DPC adoption had come about because of two coinciding forces. The most visible of these was, obviously, the pandemic, which placed a huge burden on design, development, prototyping and sampling workflows that suddenly had no physical outlet and needed to shift quickly to digital.

But while COVID might have been the fuel for a lot of new 3D / DPC strategies - and expansions of existing ones - it found ready kindling in the maturity of the solutions and simulation engines, and the workflows built around them, that had been created over the course of decades by pioneering technology companies and the brands they worked with.

As a result of these combined factors, money flowed quickly and relatively freely into either creating new DPC initiatives, or supercharging the ones that already existed. This is the period that we have started to refer to internally as the "DPC goldrush" - a title that's examined in more detail in the editorial section of this report.

In 2023, the technology support layer for all-digital workflows is stronger than it has ever been, even if the full vision for an end-to-end "digital twin" is still yet to be realised. But while that side of the equation has only changed for the better, the proximate causes of rapid transformation that were created by the pandemic have largely gone away - simmering down to become the background noise of the new normal. And background noise does not often make for a compelling business case.

Or, to put it another way, while remote work, the shift to online shopping, and other pandemic-era effects are still being felt, they are no longer sufficient justification in their own right for new or continued investment in technology. And the investment they did generate is now expected to be delivering value before additional investment will follow, potentially bringing the goldrush era to an end.

At the same time, the global economic landscape has shifted. From input cost uncertainty to an unpredictable downstream market, and from inflation to excess inventory, there would be numerous justifications for fashion and retail businesses in the UK, Europe, and North America to pull back on their technology investments as part of the same right-sizing initiatives that are leading to cuts to headcounts, physical store footprints, and other belt-tightening exercises.

In some segments, this is definitely happening. Brands are spending less on certain solution categories, and as they concentrate on having to do more with the same resources - or less - anything that is not a core solution (one that's anchored in strategic objectives and business continuity) is being scrutinised under a brighter light.



In last year's analysis we wrote that "the pandemic did not so much prompt the market to (re)discover DPC as it did force it to re-evaluate its importance". In that context, the re-evaluation implied positive recognition: a wider shift in the industry's attitudes to a technology segment that had, for a long time, been bundled away as a design and development initiative, and an unpacking of its potential for the wider enterprise. But the same is also true in reverse, and in late 2023 and onwards into 2024, that re-evaluation will be conducted with a colder, more calculating eye.



This brings us to another key finding of this analysis: that there is a clear line that can be drawn between the ways that different organisations think about DPC, the extent of the value that those companies have been able to obtain from it, and, consequently, whether their DPC strategies are likely to be protected at a time of reduced technology spending, or whether they stand the chance of being trimmed back.

For organisations that look at DPC solutions as tools that are exclusively intended for creative experimentation, or as visualisation tools, these initiatives are more likely to be seen as expendable. There is a logic to this: it is easier to reduce cloud, software, and service spend in one narrow area than it is to do the same with core business systems. And while readers of this Report more than likely know that this is a false distinction (the potential of DPC exists at both the heart of product creation and up and downstream from there, and there is little logical in trying to separate the two), there is nevertheless the risk that these companies will see DPC as something that has fulfilled a relatively narrow set of goals and that does not need to extend any further.

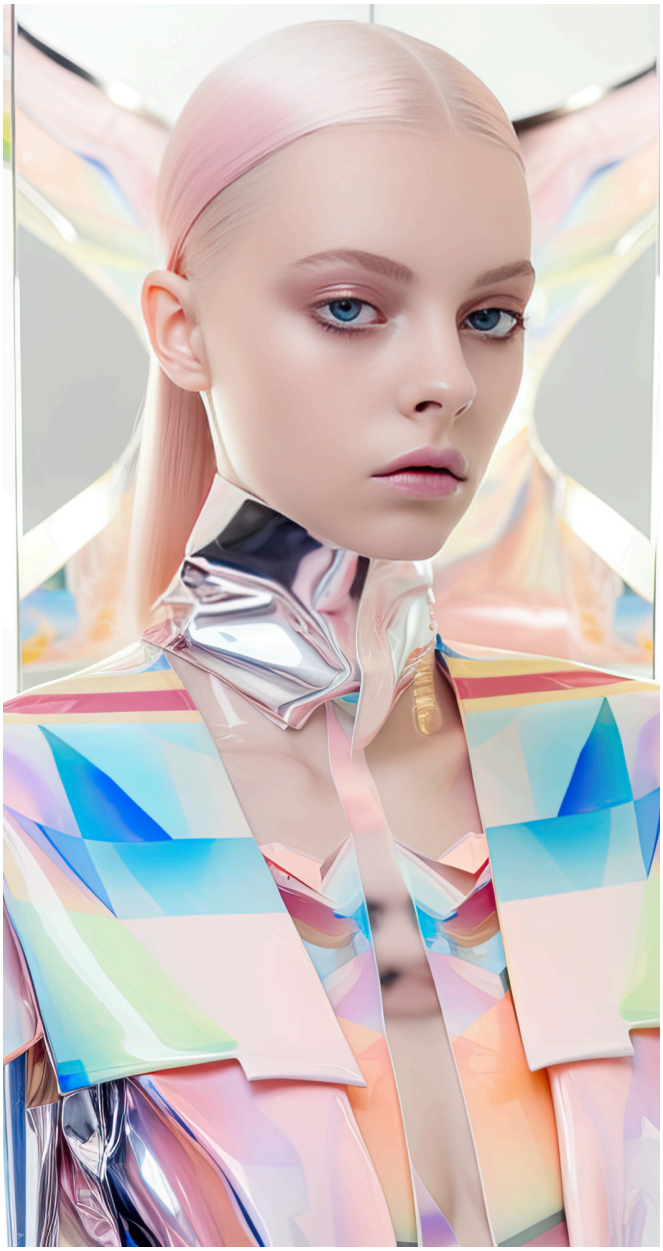
For companies on the opposite end of the spectrum, who see 3D design and development as just the jumping-off point to a much broader transformation that covers production, sales, marketing, sustainability, real-time engagement and much more (and there are many of them in this report) DPC strategies are far more likely to be seen as foundational than as peripheral pilot schemes, securing their share of budget even as outward circumstances become more difficult.

In practice, this disconnect runs the risk of widening the gulf between early 3D pioneers (again, a cohort that's well-represented in the editorial and technology vendors sections of this publication) and late starters. For the former, the pathway to obtaining additional value from digital assets is clearer and already trodden up to a certain point. For the latter cohort, companies that are only just beginning on their DPC journeys, that pathway can seem daunting in its scale and possibility space, and the investment required to obtain the returns that earlier adopters are seeing will feel over-facing. And this, ironically, could lead to even more organisations settling for 3D as just a way of replacing physical samples, and never growing into the possibilities on the horizon, because the investment required to do so feels prohibitive..

All of which will make it imperative for brands, retailers, and suppliers to build DPC project plans that realise value in discrete stages, as well as contributing to all-round, long-term digital transformation.

MARKET SHAPE AND MATURITY

Those pioneering companies that identified the potential of digital tools, workflows, and assets that originally began life in design to serve as engines of much broader transformation, are, as we might expect, the ones pushing the envelope of DPC maturity further forward. And as more of their in-house and external audiences place their trust in those digital workflows, the wider vision for digital creation is being actively stress-tested and developed as we write. The biggest 3D and DPC technology vendors are active participants and partners in a lot of this envelope-pushing, and new use cases, possibilities, frictions, and challenges as being identified.



But while these brands and retailers are embracing the idea that DPC tools and workflows can do much more, increasing the upper bound of market maturity, fashion's baseline understanding and deployment of DPC is also rising, and carrying all boats with it. And this is where we see strong market advances from solutions that are disruptive in their capabilities, as well as from tools that are disruptive because they lower the cost of entry or other barriers to capitalising on the potential of DPC.

Whether they cover low-cost fabric digitisation with consumer hardware, or a fundamental challenge to the core foundations of computer graphics, these tools are designed to work for everyone, and they are generally priced accordingly. And although organisations that have already begun to explore, for example, traditional material capture methods, or digital avatars, or local rendering, stand to benefit from fresh approaches, all of these are elements that will also make it easier for new organisations to get started.

As a case in point, content libraries, the unsung heroes of many PLM and other enterprise system implementations, have assumed a new importance in DPC, with quick-start collections and other ready-made assets allowing new users to avoid starting from scratch. This is a direct example of best practices and road-tested workflows that were forged by pioneering brands and vendors going on to benefit the wider community.

And although this analysis is focused on the adoption of technology by in-house and supply chain teams, we are also now seeing the continued growth of the "content partner" or "agency" model, with experienced creatives deploying these same tools (and best practices and systems from other industries) to create digital assets and experiences that brands either lack the skillsets to build for themselves, the talent pool to generate at scale, or that they they simply want to employ external expertise to create.

In last year's analysis, we said that, "if fashion is able to scale its use of 3D the same way that other industries have, then fashion is likely to be able to realise many of the same benefits." This can be read in two ways: the first that many of the tools that are now sold to fashion customers under the DPC umbrella have their

roots in other sectors entirely; the second that even the most advanced industries, when it comes to 3D, still opt to work with external teams to craft their showpiece assets and campaigns.

You will find several perspectives on the role of the bureau or creative agency in this report, but the key takeaway is that market maturity should not just mean greater adoption of in-house tools - it also means greater awareness of where the limits of in-house expertise lie, and where it makes sense to find appropriate partners to look beyond those limits.

This is something that our team believes we got wrong last year. We wrote, in our 2022 DPC Report, that "the agency ecosystem was likely to be scaled back as fashion matures its use of DPC and hires in more talent", but in practice we do not expect this to happen. Will the fashion industry always need as many DPC bureaus and agencies as it has today? Potentially not, as new solutions and ongoing technology refinement make those skillsets more accessible. Will the best of those agencies continue to be awarded high profile campaigns and deliverables the way they are in other sectors? More than likely.

As a final note on market maturity, it is important to draw attention to just how long the average DPC technology vendor has been in business. We have already established that 3D and digital product creation are not "new," despite the COVID-era goldrush towards them, but there are a fair number of brand and retail businesses active in this space who may not realise just how storied a technology segment this really is.

The team behind The Interline, for instance, has been writing about DPC for a long time. See The Annual Review, 5th Edition, published under the WhichPLM imprint, in 2015, which contains quotes like this one: "We consider 3D as the foremost technology capable of revolutionising the long-standard paradigms of design, development, manufacture and consumer engagement."

This is not just to point out that we were especially prescient when it came to 3D (although some of the authors here will take a little credit in that regard), but rather to demonstrate that, nearly nine years ago, the transformative power of 3D was on plenty of people's minds - even if the acronym "DPC" had yet to crystallise around it.

That's also evident in the average age of the technology companies that participated in this year's report: 15 years. This means that, as a centre-line, the technology landscape for DPC has been developing commercially and technologically since at least 2009, with the cornerstone companies being founded in the 1980s and 1990s, and even the newest disruptors on display this year all predating the pandemic.

It is also vital, of course, to respect the amount of time that brands have devoted to the DPC endeavour. Plenty of the organisations that are doing remarkable work in-house, up and downstream, with digital tools and assets have been growing their digital ecosystems and capabilities, alone and in partnership with technology companies, for a decade or more.



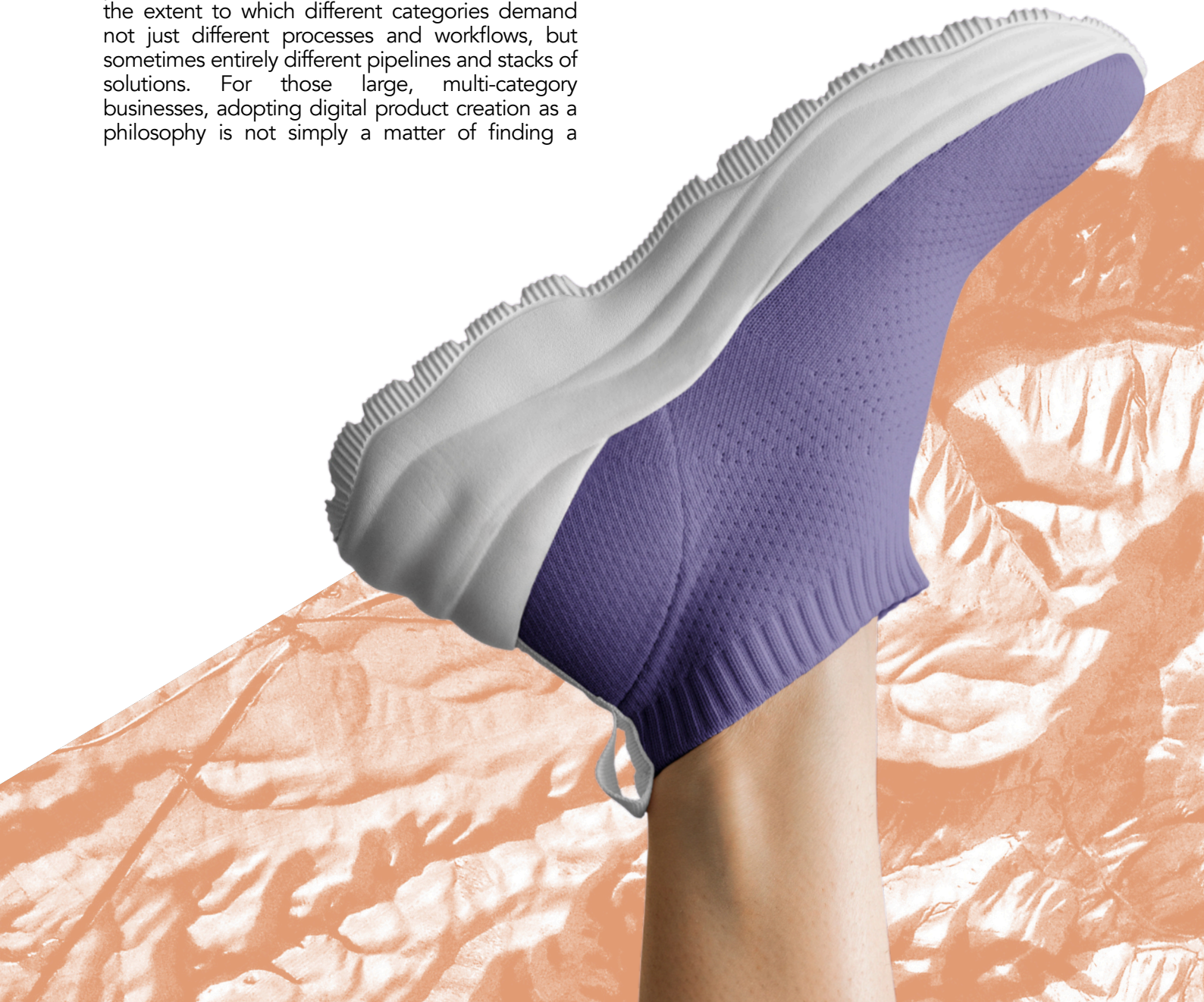
A NOTE ON PRODUCT CATEGORIES

There is an increasing recognition, industry-wide, that different product types need to be catered for with specialised solutions. Workflows across apparel and footwear vary as dramatically as the components, materials, and engineering processes involved in each product type do, and especially in areas such as the link between 2D and 3D working environments, or 2D to 3D to 2D workflows that exist primarily in footwear.

You will find footwear-focused technology companies featured in this report, as well as stories from footwear-focused brands, and the same from both sides for apparel. And if your business is strongly weighted towards one of these categories, we would encourage you to ensure that you are looking at both leading cross-sector tools and best practices, as well as more tailored solutions.

Among multi-category brands and retailers, the process of assembling this market analysis revealed the extent to which different categories demand not just different processes and workflows, but sometimes entirely different pipelines and stacks of solutions. For those large, multi-category businesses, adopting digital product creation as a philosophy is not simply a matter of finding a pipeline that works for a single business unit and then extending it outwards - it is instead a matter of identifying the right pipeline, the right workflow, and the right supporting technology for each individual product category, and the teams that specialise in creating it.

In practice, this means that a single brand can, conceivably, use many of the solutions listed in this report and in last year's instalment - all at the same time. Unlike other enterprise software categories, where a single system tends to become codified as the accepted standard, DPC technology estates are far more flexible and adaptable, and brands at large are putting this knowledge into practice by prioritising what they believe to be the right solutions for each of their business units, rather than focusing on a single portfolio.



PRICING AND DEPLOYMENT

Our analysis of the market this year takes in many returning vendors and service providers, but also several new ones - across categories as diverse as 3D simulation, collaboration, material capture, digital colour, virtual models, digital asset management and more.

Like our last market analysis, we also see a very broad spread of different pricing models across those different solution types: one-off purchases, subscription licensing, charge-per-use, tiered pricing and modular purchasing structures, enterprise volume discounts, and even perpetual licensing.

This makes direct comparisons difficult, but for the purpose of establishing a fair standard for this analysis, we have focused exclusively on software licensing - subscription, perpetual, and other methods - as our blueprint for evaluating the size and scope of the DPC market. The results we obtained from this analysis are captured in the "DPC userbase" and "Market size estimation" sections below.

(Please note that this does not imply that single sale instances, or per-usage models are not revenue-generating or that they are not the right fit for the businesses they are built for, but rather that, for the sake of comparison, software licences are the most common currency.)

In terms of deployment, while hardware is obviously installed on-site - either at the brand's headquarters or, preferentially, as part of a wider industrial roll-out in the supply chain - DPC software is almost universally available globally. This should not come as a huge surprise, since the same is true of most consumer and enterprise software segments, but when we consider the potential of 3D and DPC tools to empower new design communities, that global availability matters a great deal.

While our 2022 analysis found a stark divide between applications and use cases that were primarily deployed in the cloud, and those that were run on powerful local hardware, that gap is no longer as pronounced. It was, just a few years ago, the case that 3D simulation, design, and rendering work needed to be performed on local hardware, but the rise of cloud render platforms and pixel streaming (where intensive applications are run on remote hardware, with video streams sent back to the user, and inputs sent the other way) have blurred these lines in product creation the same way they have in content consumption.

Finally, while attitudes and approaches to pricing and deployment remain essentially the same this year as they were in 2022, we are seeing a steady move towards bespoke enterprise packages and pricing-through-negotiation - especially from the technology companies that deal with larger brand accounts. Whether this proves to be a negative step in the long run remains to be seen, but customised pricing has, in other sectors, led to customised deployments, which have a complex legacy that market segments like PLM are still working to unpick.





PARTNERSHIPS AND INTEGRATIONS

In the market analysis portion of our DPC Report 2022, we wrote that: "For the long-term vision for digital product creation to be realised, it will be essential for both finished assets and their constituent parts to be usable in as many different solutions and environments as possible."

This is, after all, the vision for a digital asset: to have the greatest utility possible, ignoring file format, ecosystem, and other barriers that stand in the way of interoperability.

Our 2022 analysis, fortunately, revealed a prevailing attitude of openness and integration amongst the technology community, and this year's data is no different. Even the newest technology companies typically have ten or more active partnerships or out-of-the-box integrations, and the largest and longest-serving technology vendors have many, many more - running the gamut from digital material platforms to real-time rendering engines.

Consistent with our 2022 analysis, this year's partnership breakdown shows that the household names in 3D design and simulation remain the most prevalent points of integration, but we also see other companies that constitute the 'infrastructure' of DPC appearing often - covering material capture, colour management, and more.

We also observed a trend towards integration with sustainability and lifecycle impact assessment platforms - something that is entirely logical when we consider just how closely intertwined design, engineering, fit, and material development are with the final footprint of a product.

And, in light of the work that has gone into bringing fashion into the real-time world - including numerous crossovers with videogames and other media - it is no surprise to see several mentions of partnerships with Epic Games (developers and custodians of Unreal Engine), Unity (the other low-royalty real-time engine), and NVIDIA (creators of GPUs and, lately, specialised AI chips that are worth as much, pound-for-pound, as gold). This is, it is important to note, supplemental to the broad support that the DPC ecosystem has for offline rendering environments and toolsets like Keyshot, Blender, Maya and so on.

There are two conclusions to draw from this year's data on DPC partnerships. The first: despite the largest 3D vendors pushing ahead with plans to expand their process coverage into content management, cloud collaboration, and other areas, this has not negatively impacted the sector's overall openness. The second: the availability of on-tap services like cloud rendering and avatar creation on a per-call API basis could prove to be transformative for companies that need those capabilities for their own purposes, as well as for other technology companies that wish to include them as branded or white-label additions to their own solutions.



THE DPC USERBASE

As mentioned earlier, there is considerable crossover between different solutions under the DPC umbrella, such that a "client" of one technology company is likely to also be a customer of many others - even if the capabilities of those solutions seem, at first glance, to make each other redundant.

For this reason, our analysis does not attempt to segment the DPC userbase into market share for each technology vendor, since these lines are sufficiently blurred as to be basically pointless to draw. There is, however, one exception we want to make to this rule for 2023/24, since one of the leading 3D design and simulation vendors claims to have crossed the million-user threshold.

This is not a statistic we can independently verify, but it is a useful indicator of just how dramatic the uptake of DPC tools has been over the last year - building on top of already-precipitous growth in adoption the year prior. It is relatively routine for well-established DPC technology companies to claim tens of thousands of users, and hundreds upon hundreds of brand customers.

For the purposes of our analysis, we apply some insight and intuition to pare down these user figures to something we consider more representative of reality (taking account of non-commercial licences and other variables) but even this low-ball estimate gives us a DPC userbase of at least 175,000 active monthly users, including information gleaned from the DPC Report 2022 and this year's data.

This install base is truly diverse in terms of business types and sizes, although we should note that the largest brands, luxury houses, and retailers in the world are all either openly or privately known to be DPC users to a greater or lesser extent. And if you have read the full editorial portion of this report before jumping to this section, you will know that DPC tools - especially in digital materials, 3D design, and simulation - are great levellers, with the same software being used by an independent designer to create the hero outfits for this report.

We should note that we do not have sufficiently granular data, at this point in time, to conduct any reliable job role separation, or to distinguish between brand users, fabric mills, manufacturers, and other value chain users.

We generally believe, though, that the figures we were given correspond primarily to people who are actually working in design, development, materials, sizing, and other core in-house tasks. These are what we consider to be DPC users, since they are directly creating, manipulating, or working with digital assets, making them distinct from the essentially limitless pool of fashion personas who will later interact with those assets.

By way of a final user count: in our 2022 analysis we pegged the install base for DPC software in fashion to be "at least 45,000 monthly active users". This was, as mentioned in the introduction to this analysis, a conservative estimate, and although we have been similarly conservative this year, we now believe the baseline figure to be at least 75,000 monthly active users, and potentially 150,000 or more.

These upper and lower bounds reflect a degree of uncertainty that persists around the nature of vendor-created user counting, but The Interline believes that the lower bound is a pessimistic interpretation, and that the upper bound (despite the name) is still likely to be a pragmatic under-count.



MARKET SIZE ESTIMATION

Looking back again at last year's market analysis, we stated that the DPC software market for fashion was generating at least $40 million (US Dollars) in annual revenue from licensing alone. This was, as with the user count our calculations are derived from, a very low estimate compared to the figures we were provided, but it was - again - one that served as a useful baseline.

This year, equipped with more in the way of volume and completeness of data, we believe that figure needs to be revised upwards in the same way as the overall user count. And while this analysis is not in the business of naming "winners," it is clear from examining public information (and blending it with private disclosure) that there are DPC vendors whose standalone annual revenue would account for a good proportion of that industry total.

To arrive at an estimate for the total market size of DPC for fashion (based solely on software licensing, and excluding service revenue and other streams) we multiply these conservative user counts by a mean monthly subscription amount - derived by combining multiple vendor licensing structures and determining the centrepoint - to arrive at an upper and lower bound figure of $45 million and $90 million respectively.

Both of these calculations use the same subscription amount, so their variance is determined solely by the number of users, and the discrepancy between the marked rise in user numbers and the comparatively shallow rise in lower bound revenue is due to our team having a wider view of the market, which resulted in us lowering the average subscription cost used in our calculations compared to our 2022 analysis.

Like our 2022 market analysis, these figures do not reflect the complete scope of the market, and are based primarily on the data provided by vendors who have taken part in this year's report and last year's counterpart, so there is still work to be done to round out this market sizing to reflect the wider scope of the segment. But even based on this next-stage baseline, it is clear that the DPC market for fashion may not just be the equal of existing enterprise segments like PLM - it could potentially be larger than them.

(Finally, we note that this revenue analysis does not include advisory companies or agencies, whose clients are not software users and whose income therefore is not attributable to software licensing, even if those agents and advisors do end up licensing software themselves.)



CONCLUSION

As a market analysis, these pages have been focused primarily on the commercial viability, growth potential, and financial statistics that collectively shape the visibility of DPC as a standalone technology segment - the equal to, or larger than, some of the largest enterprise software sectors. But since this conclusion also represents our team's last word in this report, we would like to take this opportunity to loop back around to some softer and more qualitative metrics.

Any readers who happened to attend 3D Tech Fest 2023 will have seen our Editor-in-Chief talking about the potential for DPC and digital assets to improve the drive for inclusivity, diversity, and adaptability - all of which this technology segment has the potential to do, by improving sizing, by lowering barriers to entry, and by distributing decision-making power and the mechanics of production more evenly.

And any readers who also attended the summer 2023 season of SOURCING at MAGIC - our sponsor for this report - will have heard us also talking about the potential of 3D and DPC tools and workflows to transform the way emerging designers and entrepreneurs think about their design, development, sourcing, sales, and marketing. These smaller companies and single-person businesses may have a harder hill to climb when it comes to truly capitalising on the wider enterprise potential of DPC, but they are well-catered-for by a range of different affordable, accessible solutions that allow them to shorten the distance between their ideas and a finished product.

This is, of course, all in addition to the work that brands big and small have already put into unpacking and scaling the possibilities of DPC - and what those forward-thinking companies do will have a pronounced effect on how solution maturity, accessibility, integration, and automation develop over the next few years.

Whatever your role in fashion, though, we would encourage you to take away from this publication - once you have had the opportunity to digest it all - a recognition that you and your colleagues across the value chain are part of a significant change in the way the fashion industry operates.

We may not expect our sales and revenue data to jump up dramatically in the near future, but we do expect to continue to see progressive increases in the amount of brands, retailers, suppliers, and agencies adopting, internalising, and working with DPC tools. Because this remains a technology segment that is firmly in the ascendancy - as evidenced by the investment that continues to be made in it, and by the confidence that technology vendors and their customers have in telling their stories.

And there will be many more of those stories to come, and much more underlying data for The Interline to analyse in future publications.

The Interline would like to extend our thanks to every technology and service provider who took part in this year's DPC Report, and to all our editorial contributors, as well as our long-time sponsors at Informa Market Fashion - the team behind SOURCING at MAGIC and other milestone industry events.

We hope you found value in this publication, and we encourage you to bookmark The Interline for more coverage of digital product creation throughout 2024, leading up to the next DPC Report at the end of next year.

If you are a technology company creating DPC-ecosystem tools, or a brand, retailer, or supplier using them, and you'd like to be featured in next year's DPC Report, please contact us.



The INTERLINE

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