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Responsible Fashion- How Do We Make Ideas a Reality?

Title: Design Realisation in Fashion Education – Embedding Sustainable Approaches Through ‘Phygital’ Practices.

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INTRODUCTION

This chapter presents a case study, timely analysis, and critical reflection of sustainable practices in UK higher education for fashion. We focus specifically on the BA (Hons) Fashion Design & Technology Degree program at the Manchester Fashion Institute of Manchester Metropolitan University (UK), during the global pandemic of 2020. The outcome proposes a novel framework for a sustainable approach employing nascent practices incorporating the body, craft, and technologies.

The role higher education plays in preparing the next generation of industry professionals is noted as a critical factor in the potential to shift to a more sustainable industry (Kent & Ifeagwu, 2019). In the context of fashion design education, the global pandemic impacted institutions providing onsite practice-based courses; whereby students and staff quickly transitioned from on campus to 100% online.

As the effects of the Covid19 pandemic began to impact daily lives from early 2020, bringing unprecedented challenges globally, no person or organisation remained unaffected. Yet in parallel, the impetus to drive some semblance of ‘normality’ and service continuation, along with future thinking was apparent, not least in higher education, where pre-planned on-campus practical fashion course delivery became disrupted.

So, whilst there were many competing urgent practical and pedagogical imperatives

where did this leave sustainability?

Coupled with knowledge that the fashion industry is cited as the second largest polluter in the world, with a vast range of potentially negative affects on the environment (Niinmaki et al 2020), the role of fashion educators in facilitators for agents of change, remained omnipresent during the height of the pandemic induced lockdowns.

Whilst challenging, on many levels, the move to remote delivery also offered unexpected opportunities to accelerate, experiment and reflect on sustainable practices in unprecedented circumstances. Furthermore, a novel framework emerged encompassing nascent practices and is offered as a means to explore alternative ways of engaging in design and product development.

CASE STUDY CONTEXT

Students on their second-year undergraduate degree programmes of BA(Hons) Fashion Design and Technology in Menswear, Womenswear and Sportswear took part in a unit of study titled Fashion Product. Industry led briefs tasked students to create aspirational but commercial fashion product or ranges appropriate to a defined customer or community and a chosen market level. Students are encouraged to take an explorative approach to the design and development of fashion product. Consideration of innovative garment finish, details, materials, and construction techniques are at the core of this unit. Processes and outcomes are professionally presented and communicated using standard industry practices, language, and innovative technologies. Within this, students would typically hone their skills and draw upon knowledge from both their first year of study and first term of their second year to realise and technically communicate their outcomes.

The staff were not only committed to delivering and supporting students to continue their studies, but also to enhance, encourage resilience and consider fresh perspectives rather than focussing on restrictions and loss brought about by the Pandemic. Opportunities were sought to build on quality experiences for student learning as well experimental ways of approaching the unit objectives at a scale suitable for a remote learning cohort of over 60 students.

Not only were the systems in place in complete flux but the student experience moving from a very practical onsite course to unexpected ways of study, meant that staff were super quick to empathise and encourage transition to setup offsite home studio spaces. Strategically staff worked behind the scenes, to ensure students could have the fullest experience given the scenarios presented in response to the global situation.

Significantly it was also an opportunity to take practical steps to consider habitual modes of 'doing' from a fresh and more sustainable perspective. Whilst unexpected; the role of remote learning and extreme restricted access to resources, such as mannequins and facilities, suddenly became a platform for change.

PRE-PANDEMIC – RECOGNISING WASTEFUL PRACTICE

Prior to the global pandemic, and during the unit running in 2019, the academic team witnessed valuable 'final' fabrics being used for development of toiles (prototypes). To address this, the brief had already been amended for 2020, offering students a carefully *preselected* group of toiling fabrics only. This was effective for teaching, learning and assessment, however it was recognised this set of processes alone continued to generate a minimum of over 60 potentially discarded full scale garments. Whilst the department already had a range of facilities and procedures to encourage mindful use of resources, including toile, textiles, paper and card re-purposing and recycling setup by the technician team, it was recognised that the practice of prototyping was an area of potential waste of full-scale sample garments. This put into question were the current submission requirements of *full* scale necessary for prototyping and was this actually,

embedding a framework for waste?

In addition, it became apparent that whilst over 87% of the student cohort had previously worked at half scale for pattern making and toiling in their first year of studies, when entering their second year, there was a noticeable student preference to work at full scale in studio. It was recognised that there was some work to do to encourage a higher number of students to continue to embed half scale during sampling.

FACILITATING REDUCTION OF MATERIAL USE - AMENDING STUDENT SUBMISSION CRITERIA

To reduce the collective consumption of materials and amplify the validity of working at half scale, a team decision was made to modify submission from a full-scale physical prototype to optional half scale physical OR digital prototype (more on 3D digital later in the chapter). Examples of a range of current and historical brands working in a reduced scale than full scale were shared with students. One such example was the Théâtre de la Mode exhibition of 1/3rd scale mannequins wearing haute couture creations, this 1945/6 travelling exhibition devised by Ricci (Zimmerman, 2020) was in response to post 2nd world war resource rationing yet remains very relevant in the 21st century, as shown by Chiuri for Dior's Autumn/Winter 2020-2021 Haute Couture collection using 37 mini dressmaker mannequins (Vogue 2020).

NEW MODES OF STUDY ENVIRONMENT - HOME STUDIOS & REMOTE LEARNING

Pre-pandemic on-campus environments included a combination of design studios, industry standard machine rooms, innovative manufacture and joining technology zones, 3D body scanning, textile labs and a range of 2D & 3D digital pattern and CAD, material printing, laser cutting and 3D printing.

Design realisation would be through sampling in half and full scale on studio mannequins, and garment realisation included regular fit sessions with live models emulating industry processes. Furthermore, students are taught to develop their ideas using 2D and 3D digital applications such as CLO3D® and Gerber AccuMark® 2D pattern making, along with more traditional 2D CAD Illustration software. Emphasis sits across a range of industry standard and emerging technologies when integrating physical and digital garment construction.



Figure 1 - example of a home studio environment with ½ scale mannequins. Courtesy of Adrian Thorn

Students were encouraged to create their own home studio workspace, for some this was shared with other students or family members, others were able to have a more permanent space, most would need to be more flexible to put away their 'studio' at certain times of the day to accommodate other inhabitants.

Aside from the home studio environment, resources such as mannequins were an integral part of sampling. Pre-Covid, students would have access to a range of resources including full-size and half-scale industry standard mannequins. This was a popular resource with both students and staff and played a significant role in practical knowledge-building of anthropometrics on three-dimensional bodies.

NEW DESIGN PRACTICES - FROM CRAFTING MANNEQUINS TO THE CUSTOMISATION OF AVATARS.

Several students no longer had access to a mannequin, nor the space to store a full-scale version, so, to solve this, the wider staff team generated resources for students to craft their *own* ½ scale mannequins. An example of a home studio setup shows two hand crafted half scale mannequins in figure 1.

In conjunction with mannequin making, a range of ½ scale blocks were made available via the Virtual Learning Environment (VLE), printable or traceable via a laptop or computer screen.

Avatar customisation is becoming part of a designer's potential workflow when employing 3D digital design tools, however, it's unique to consider including practices of creating *physical* versions of mannequins along side digital avatars.

Through the crafting of half scale mannequins *and* customisation of avatars, it was noted there was a much higher level of consideration of body diversity and how engaging in bodily practices linked to sustainability. Figure 2 shows examples of the mannequins and avatars.



Figure 2 ½ scale mannequins and digital avatars as mannequins by Elsa Krawielitzki, Emily Atkinson and Ben Rudderham

Mannequin make methods were open to interpretation through individual customisation in comparison to the more typical ways of choosing from a selection of industry standard mannequins. This led to a wider variety of body shape, size and aesthetic outcomes than previously seen. Whilst the industry standard is to fit to standardised shapes and sizes, there are ongoing issues of fit and product returns in relation to fit, this process illuminated some of the challenges of the fashion system and complexities of designing for a range of bodies.

Furthermore, as part of 3D digital design and prototyping, students customised an avatar via editing features of sizing, aesthetics and pose. Whilst this is a more recent step brought about by advances in 3D technologies, it has the potential to encourage engagement with the body and the complexities of representation of a more inclusive range of bodies and how that affects potential issues with fit. Both elements generated critical discourse on the impact of processes and resources during design and development.

3D DIGITAL TWINS – ACCESS TO DIGITAL ASSETS

As the students were embracing their design and sampling using half scale mannequins, the academic and technical team worked together to deliver online access to one of the 3D avatar-based applications, which had previously been taught in CAD studios (in this case study CLO3D®). The team were already in the process of synchronising in-studio standard pattern blocks, (2D digital twins of physical studio patterns) and so accelerated the creation of 3D digital twins by working very closely with the technical services team.

Blocks were imported into CLO3D® and setup to simulate digital material and aesthetic properties emulating the physical blocks in prototype fabrics with annotation. 3D digital versions were enhanced by being digitally 'stitched' together unlike the cardboard or 2D CAD pattern versions. These were available as digital assets for download.

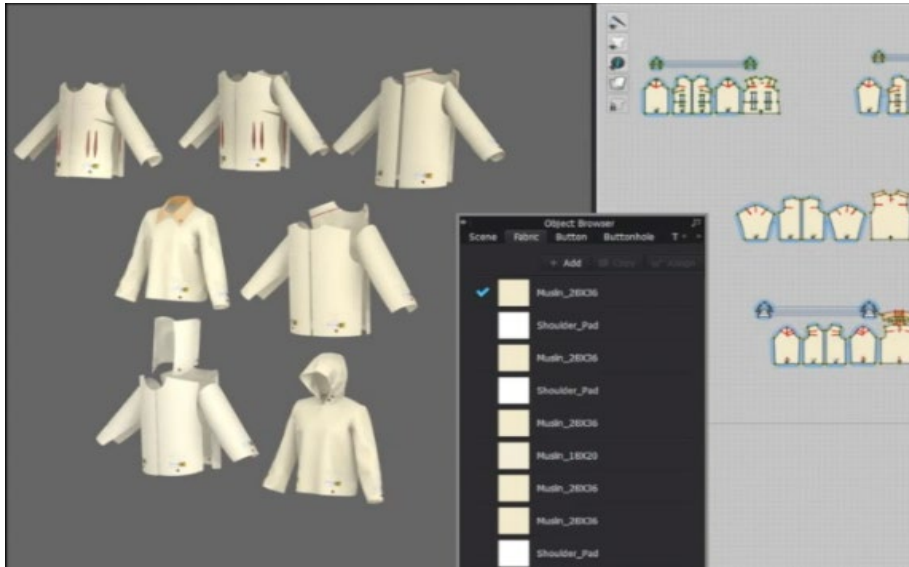


Figure 3. Examples of 3D Digital Twin Pattern Blocks as CLO3D Stitched Project Files (Mary Aspinall)

Blocks were created to drive a sense of connection between 3D physical, 2D digital and the ability to work across half scale and full scale as part of a 'Phygital' strategy (merging physical and 3D digital ways of working). By fostering a culture where students could take ownership in exploring their own design thinking, incorporating physical and digital fashion design and development whilst highlighting opportunities to experiment digitally and potentially reduce the use of materials for sampling/toiling.

During lockdowns, 2D/3D software was made available to students via Virtual Campus and licences for direct installations. Aside from pacing and planning online sessions to consider the range of abilities, and where students were working from one screen to learn, there was a strong sense of playfulness to encourage students to share their progress at key points within the online classes.

BUILDING ONLINE COMMUNITIES OF PRACTICE

Vibrant online communities were facilitated by staff to engage students in mannequin making techniques and to provide a virtual space for students to come together whilst geographically separated. Students showcased and supported each other's creations via an online sharing board (Padlet® - figure 4). Interesting conversations were borne around material upcycling and use of non-virgin materials for the half scale mannequins as well as the perceived benefits of digital creation in experimenting without the use of physical resource.

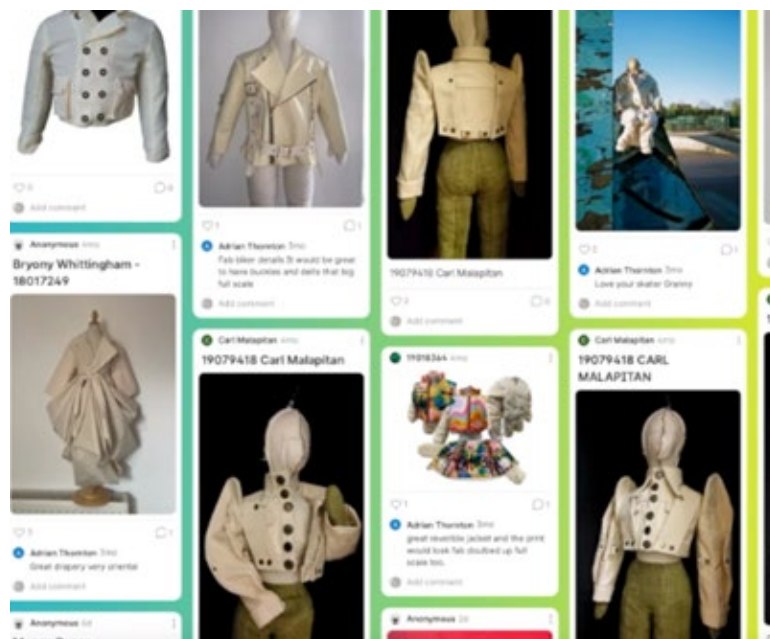


Figure 4 online community space

To build confidence in 3D digital approaches to design and sampling an online chat space was created specifically for 3D digital topics. This was unique in that it sat *across* other units and level of study (using Microsoft Teams®). Taking the students beyond timetabled study groups opened opportunities for a broader and more enhanced student experience as connected practitioners despite the removal of physical opportunities to meet, discuss and support each other.

THEMATIC ANALYSIS AND CRITICAL REFLECTIONS

A series of five key themes were drawn through analysis of the unit outcomes, approaches, and reflections during the case study.

1. 50% reduction in physical material consumption by employing hybrid half scale and 3D digital prototyping.

A combination of half scale physical along with 3D digital prototyping resulted a significant reduction in material consumption of the unit, from an estimated 561 metres of toiling fabric consumed down to 275 metres, with a proportion of this using repurposed materials.

Working in ½ scale was also found to be more suited to onscreen communication where the reduced garment scale made the process of online tutorials more effective as students could sit closer to the screen and hold up/show details of the garments as shown in figure 5. Those who did use full scale had more difficulty in showing a full perspective of the garments and their details due to space in their home studios, lighting, proximity to their laptops, tablets and at times smart phones.



Figure 5 Working at 1/2 scale more suited to onscreen tutorials – Thea Dansey

2. New design practices – critical discourse through the making of bodies (mannequin/avatar)

Common practices of working on 3D garment shape making are often initiated through the selection of an industry standard size mannequin such as Alvanon Alvaforms®. Digital twins of the inhouse Alvanon® mannequins are also available as avatars. More recently the inclusion of avatar creation and customisation has broadened the potential tasks designers could be involved in when working digitally.

The new task of students creating their own physical (half scale) mannequins offered an opportunity to merge traditional craftsmanship with a reduction in material resource. This also provoked animated discussion on themes of diversity, sizing and shape, industry 'standards', the impact of understanding and engaging with the body and how this may have a positive impact on sustainability of products or process. A number of students also created their mannequins by repurposing materials rather than sourcing virgin materials.

Moreover the combination of physical mannequin make and digital avatar bodies initiated an understanding of a 'phygital' approach to working. Phygital is a nascent term used to describe the concept of bridging digital and physical worlds, and in this context within the workflow of fashion design and product development.

3. Phygital & Playfulness – A focus on sampling of detail physically whilst employing digital for shape and silhouette.

It was noted students used half scale and 3D digital for silhouette and shape making; reducing the use of virgin material resource whilst full scale sampling was reserved for smaller elements and features such as pockets, collars, fastenings, features and design details. The creation of digital mannequins was cited by the students

as both fun aspects but also seen as opportunities to enhance knowledge of bodies through untraditional methods. The customisation of avatars tended to be futuristic rather than digital twins of the aesthetic of the hand-crafted versions. They also tended to be more aligned to retail mannequins aesthetically. Avatar customisation of size, pose, posture and movement led students to be more engaged in the affect of their avatar choices which hadn't previously been a significant part of discussions using any scale of standard studio mannequins or live fittings. An increase in students wanted to create themselves or a representation of their target consumer as avatars and some students chose the option to make the avatars hidden within their work.

4. Changes to submission criteria as agent of change

Overall it was found the student cohort chose to submit their work across the full range of final outcome options. As expected the majority of students selected the familiar practice of physical prototyping, though these were significantly ALL half scale. 20% chose the digital submission route, entirely creating and realising their garments using 2D and 3D digital tools. Within the 20% several students adopted a novel approach to their practice whereby they employed a fluent hybridisation of part physical, integrated with 3D digital sampling and developments as effective examples of 'phygital' approaches encouraged by staff.

5. Proposed Framework – Hybrid Design & Realisation – A Phygital Process Framework

Outcome of the analysis led to the proposal of a framework titled 'Phygital Fashion Framework for Hybrid Design & Realisation' (see figure 6)

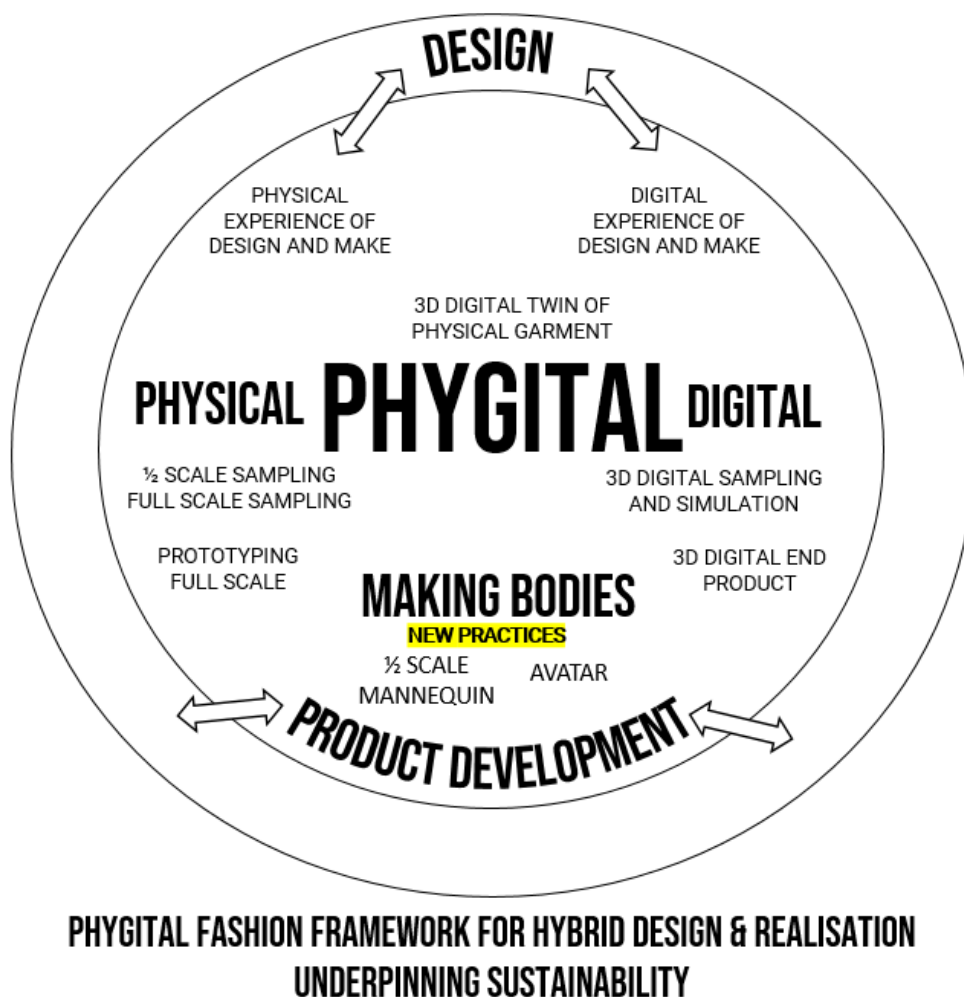


Figure 6 Phygital Fashion Framework - for Hybrid Design and Development – Underpinning Sustainability

The framework centres around the proposal of a phygital approach, highlighting the new design practices encompassed within design and development. These nascent practices whereby designers engage with the body through physical ½ scale handcraft of mannequins, interconnect with digital avatar creation and customization. Hybrid garment realisation integrated across working at half scale for physical prototyping along with digital experimentation heightens awareness of the impact of methods, processes, tools, and resources on themes of sustainability.

This framework draws upon systems thinking combined with design thinking. Through systems thinking the interactions of each element within the framework are presented within an overarching circular frame of design and development. The iterative processes of design thinking are advocated by the frameworks flexible approach to considering the enclosed practices of physical and digital methods without enforcing a flow of interactions across the elements. This is in order to provoke interpretation of the framework to suit the working style of the designer conceptually.

SUMMARY

This study set out challenges and opportunities affecting sustainable approaches in fashion higher education. A novel 'phygital' framework of hybrid practices is proposed, informed through reference to student work, staff and student experience and submission criteria. Reflections are informed by the shifting focus from onsite studio practices to online learning, home studio practices encompassing working in 3D at ½ scale, the new proposed process to take part in the creation of mannequins as a new design task, along with the nascent practice of avatar creation/customisation and hybrid 3D digital and physical sampling and prototyping.

It is hoped this case study and framework will encourage those involved in these processes to find their own way of embedding sustainability; by presenting an example of tangible changes and quantifiable results to serve in raising consciousness, to challenge habitual ways of doing, and consider technologies integrated with physical craftsmanship.

The significance of the emerging role of nascent practices of engagement with the body within fashion practice is illuminated by presenting the findings as a framework and contributes new dimensions in the discipline of design. Whilst this case study sits in the context of higher education, it has the potential to act as a compelling catalyst for future interpretation within business environments as a real-world example of how practical changes can have a positive impact.

Authors

Jayne Mechan, Adrian Thornton, Becky De-Lacy

With thanks to Mary Aspinall (Technician)

Special thanks to the students on the BA(Hons) Fashion Design & Technology programme, in their second year of studies, for their resilience and the way they embraced new ways of doing and this chapter ends with examples of feedback from students.

Using half scale in Fashion Product allowed me to be even more creative in how I present my work by doing things I wouldn't normally do in a pre-covid unit. For example, being incredibly resourceful in what I use to make toiles, and then using things just lying around the house to communicate my ideas. This resourcefulness has also led me to be able to actually visualise and create a garment using left over fabric from past projects, which not only is really satisfying but even better from a sustainability aspect. I have created half scale garments all throughout university projects as having a sustainable practice is important to me. However, this project did feel a lot more fun to work solely in half scale, it felt more playful. I think being required to create a half scale garment in turn made my ideas and designs more playful"

Emily Atkinson, Sportswear

When thinking sustainably, I often looked to sustainably sourced fabric, threads and dye, however during the Fashion Product unit I began to realize the full design/ production process should be considered. If the journey to the final product was laden with wasted pattern paper, and discarded fabric, then the end product can't be branded as sustainable. Working remotely pushed me to take full use of the CLO3D and Gerber softwares. With CLO3D I produced multiple toiles, silhouettes, and shapes paper and fabric free. Using Gerber Pattern Technology I adjusted and evaluated my patterns before fully rendering the garment onto a 3D model back in CLO. When in doubt I referred back to my up-cycled ½ scale model, where I mocked up real samples using 50% less materials. This process was efficient, renewable and far more sustainable in comparison to my previous projects.

The way I start mapping out a design in 3D is usually like making a collage. I have the design next to me and I quickly cut pieces, pin and tape shapes together to get a silhouette which is as close to my design as possible. I take the pieces apart, lay them flat and these provide the pattern pieces for the next toile; slowly getting more refined and also changing in design. Working in half scale is much more manageable and helpful in the beginning stages of prototyping, as described above. It allows you to more quickly create and change the pieces for every side/360 of the garment. This process particularly facilitates the jigsaw technique of zero waste pattern cutting - a method I have been learning & implementing for the past 6 months. I made a half scale mannequin in my previous project and it has revolutionised the process for me. I think it will be hard to move away from half scale as it has so many benefits such as reducing resources & costs, a faster prototype development and ease of transferring to Gerber and CLO3D. Thea Oliver-Dansie

CLO3D has been a real saviour over the past year with studios being closed. It's really accessible, so even if you don't have the space or equipment, you were just as equipped to realise your garment. It's also a much more sustainable practice; as someone who is quite particular about fit, prototyping with CLO has been a game changer. To be able to adjust and resample a garment digitally saves a lot of fabric and time. An unexpected benefit I've found has been the way CLO developed my working method. In the past I was very methodical whereas now I am much more fluid in how I work. I really hope to develop this further and make digital development a mainstay in my practice."

Thomas Jacopo Burr - Fashion Design & Technology - Sportswear

REFERENCES

Kent, S., & Ifeagwu, H. (2019). How Fashion Schools Are Tackling the Sustainability Puzzle. Business of Fashion accessed online <https://www.businessoffashion.com/articles/sustainability/how-fashion-schools-are-tackling-the-sustainability-puzzle>

Menkes, S. (2020) Dior's Doll-Sized Couture Collection Took Maria Grazia Chiuri Back To Her Childhood, Says Suzy Menkes. Vogue.com accessed online <https://www.vogue.co.uk/fashion/article/suzycouture-diors-dollhouse>).

Niinimäki, K., Peters, G., Dahlbo, H., Perry, P., Rissanen, T., Gwilt, A. (2020). The Environmental Price of Fast Fashion. Nature Reviews Earth & Environment. 1. 189-200. 10.1038/s43017-020-0039-9.

Zimmerman, E. (2020) Stories of Resilience & Adaptation: Théâtre de la Mode. Medium. Accessed online <https://medium.com/@emilyzimmerman/stories-of-resilience-adaptation-th%C3%A9%C3%A2tre-de-la-mode-d7e8d6b96ad7>