Towards digital transformation of fashion and textiles education: a strategic pedagogy

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ABSTRACT

Gonzalo et al (2019) reported that it was 'now or never' for the industry to adopt digital methods across all aspects of the value chain. Termed Industry 4.0 or the fourth Industrial revolution, this transformation continues to accelerate. Recent technology advances incorporating generative AI were emphasised by the Business of Fashion in their annual report for 2024.

After generative AI's breakout year in 2023, use cases are emerging across creative industries, including fashion. Capturing the value of this transformative technology in 2024 will require fashion players to look beyond automation and explore its potential to augment the work of human creatives, (McKinsey; Business of Fashion. 2023).

In anticipation of this increased use of digital technology, De Montfort University's School of Fashion and Textiles co-created a strategic pedagogic approach to digital transformation, across a wide range of practice-based courses setting out a 'Digital Manifesto'.

This paper explores the development of the manifesto; the opportunities, challenges, timelines, staff and student competencies and potential impacts. Operationalising the Digital Manifesto is considered through three case studies these illustrate the different aspects of integrating digital technologies and new hybrid modes of working.

The impact of the approach has been evaluated via a series of group meetings where academics shared good practice and consider areas for development. These sessions were both reflective and forward thinking, with dissemination a key priority. By cementing ideas through conference papers has built confidence in our approach. These reflections are directing the next steps of the digital journey.

Keywords: Digital transformation, manifesto, pedagogy, fashion and textiles, innovation,

INTRODUCTION

The fashion and textiles industry is undergoing a profound shift, driven by Industry 4.0 leading to the increasing adoption of digital technologies across design, production, and retail. In response to this paradigm shift, this paper explores the development and implementation of a manifesto to guide a school of fashion and textiles in anticipating and navigating this industry-wide digital transformation. The manifesto serves as a strategic planning tool, offering a framework for aligning academic practices with emerging industry demands.

A literature review is provided to contextualise the purpose and development of the manifesto and to explain the theoretical basis of its key statements. To illustrate its practical application, the paper presents three case studies where the manifesto was operationalised: the integration of 3D CAD software into fashion design workflows, the use of virtual reality (VR) environments for footwear prototype design, and the exploration of AI-generated imagery in the concept design phase of fashion textiles.
The impact of the approach has been evaluated via a series of group meetings where academics shared good practice and considered areas for development. These sessions were both reflective and forward thinking and are directing the next steps of the digital journey.

Specifically, the research aim is as follows:

> To develop and evaluate a manifesto that guides a school of fashion and textiles in adapting to the digital transformation driven by Industry 4.0, aligning academic practices with emerging industry demands.

The associated objectives include:

1. To contextualise the purpose and development of the manifesto through a comprehensive literature review.
2. To operationalise the manifesto by integrating digital tools and technologies into academic workflows, demonstrated through case studies on 3D CAD, virtual reality, and AI-generated imagery.
3. To assess the impact of the manifesto through collaborative academic reflections and identify areas for further development in the digital transformation journey.

LITERATURE REVIEW

The development of fashion and textiles has been shaped by and has shaped technology from manufacturing to augmented reality. The current industrial revolution, Industry 4.0 or 4IR continues innovation through digitisation. McKinsey (2022) states that technology is only part of the revolution. Ensuring employees have the skills for

implementing, understanding and using intelligent computers is the real challenge. Hodges et al (2024), suggest that:

> *As the number of new technologies used in the apparel industry continues to grow, greater pressure is placed on university faculty to incorporate opportunities for students to learn them within the curriculum.*

This literature review examines the role of a manifesto within the context of a rapidly evolving educational environment. It addresses the cultural and mindset shifts required in education, with a focus on the implications for students and their expectations, particularly in light of the broader environmental challenges facing the industry. Key themes include:

- The purpose and relevance of a manifesto in driving change.
- Managing cultural and mindset transformations in education.
- Integrating key competencies in Education for Sustainable Development (ESD).
- Addressing and aligning with student expectations.

A manifesto is defined as a statement published by an individual or group to articulate their aims and policies (Collins, 2024). Manifestos provide a platform to consolidate diverse perspectives into a shared vision. This collaborative process identifies critical activities for achieving change and fosters collective commitment to action.

Currently the pace of change in technology and the skills required is rapid and there is an expectation for universities to be agile. As noted in the Degree + Digital report, (Microsoft and LinkedIn Learning, 2022),

> *The university trying to develop students' digital capabilities alone is not going to work; we are not going to be adept… I need to offer digital capabilities to our students and to our employees, but I need help to do it.*

Despite these efforts, only 28% of UK business leaders are confident in the adequacy of digital training provided by educational institutions, (Microsoft and Goldsmiths University, 2020). This highlights the need for universities to enhance their own digital capabilities by investing in advanced IT infrastructure, offering training for academics who may lack digital proficiency, and redesigning traditional curricula.

The transition to a digitally integrated education system requires a cultural shift. A report by EY Parthenon and TIAA (2020) emphasizes the importance of universities re-evaluating their core mission to ensure alignment with the demands of the Fourth Industrial Revolution (4IR).

For successful integration of digital tools, it is essential to prioritize the training and confidence-building of academics. Redesign as Kohli (2024) notes,

> *… calls for redesigning the curriculum that includes new tools and methods for effective teaching, facilitate an interactive learning environment, have syllabus at par with industry requirements, support learning by doing, and prepare for future job roles.*

This corresponds with the De Montfort University strategic aim to create true digital transformation requires a digital mindset and acumen in addition to hardware and software (De Montfort University, 2024a).

The UNESCO Key Competencies for Education for Sustainable Development (ESD) (Rieckmann, 2018) include an AI Competency Framework. The ESD competencies summarise an approach that can be applied to hybrid design practices that combine digital and analogue methods. The competencies are:

- Systems thinking competency
- Anticipatory competency
- Normative competency
- Strategic competency
- Collaboration competency
- Critical thinking competency

These are applicable to fashion and textiles through; understanding the interconnectedness of design processes, encouraging interdisciplinary teamwork, challenging traditional normal practice, exploring innovative solutions and preparing for future industry challenges.

Embedding employability within higher education curricula has become a priority, driven by pressures from stakeholders, including governments, students, and employers. The Office for Students mandates that 60% of graduates must achieve positive outcomes, such as employment or further study, within 15 months of graduation. (Advance HE, 2020)

Advance HE (2019) defines employability as,

> *Employability, in the higher education (HE) context, is about ensuring that students have the knowledge, skills, and experiences they need to be successful in their future, whether that be within employment, enterprise creation, further study or beyond.*

In summary this literature review highlights both challenges and opportunities in the digital transformation of fashion and textiles education. Achieving this transformation requires the appropriate digital infrastructure, hardware and software, with an academic team with the appropriate competencies and appetite for continual development, working in collaboration with industry to ensure appropriate curricula.

METHODOLOGY

The School of Fashion and Textiles at De Montfort University has been at the forefront of digital design application teaching and learning since the 1990s, recognising the need for academics to build competency with relevant software skills. The School has integrated a variety of applications across its practice based and business focussed programmes, these range from the Adobe suite through to specialist applications for 2D pattern cutting, 3D garment visualisation, 3D store layout and latterly working with applications for augmented and virtual realities (ASBCI, 2022). Over the last decade software companies have recognised this digital capability, with for example, the global digital solutions company Lectra, awarding De Montfort University privilege partner status and celebrating the work of Contour Fashion with a collaborative student project featuring French lingerie brand Aubade in 2015, (Lectra, 2015).

In 2021, and in the context of the 2019 McKinsey report, “Fashion’s Digital Transformation: Now or Never”, (Gonzalo et al, 2019) the school considered its strategic direction and through consultancy with The Digital Fashion Group (2024) developed a digital transformation manifesto to encapsulate its collective position and ambition regarding the future pedagogy of fashion and textiles.

The resulting document, shown in figure 1, was the outcome of a series of four two-hour directed discussions with 22 self-selected academic colleagues facilitated by The Digital Fashion Group. In these sessions the group considered its collective position, opportunities and challenges for students, the school and the industry. These discussions resulted in a consensus and a series of pledges within a manifesto.

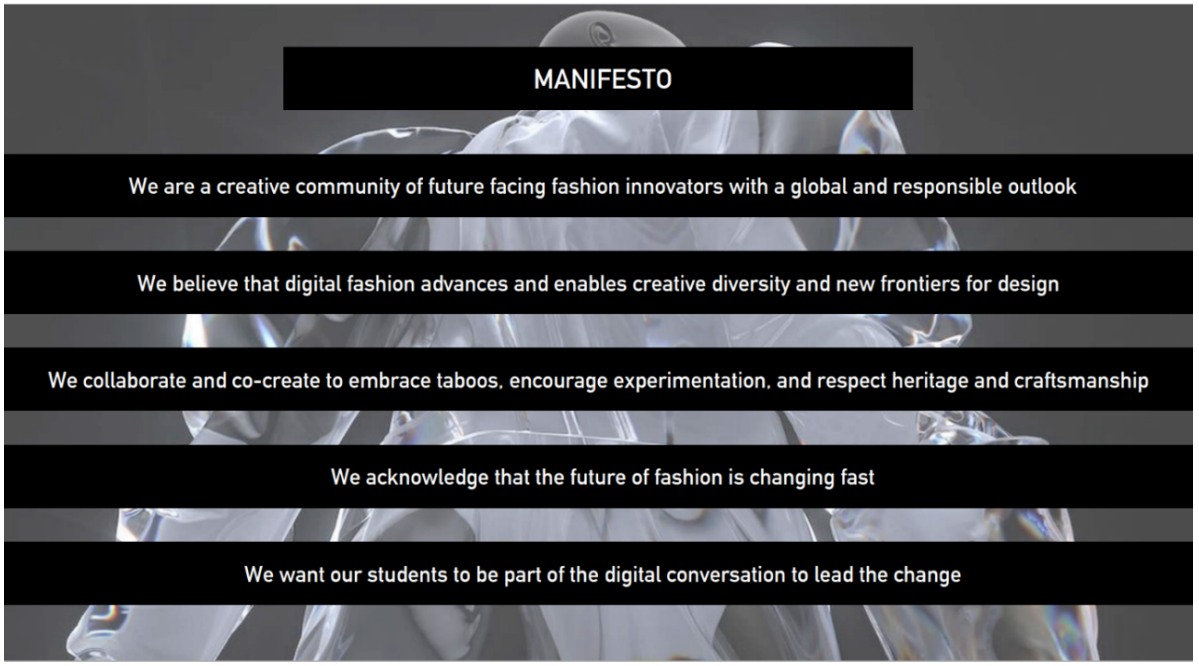

Figure 1: School of Fashion and Textile’s Digital Manifesto, created in conjunction with The Digital Fashion Group

It considers the creative community as its cornerstone and recognises opportunities to embrace new frontiers in design, to co-create and encourage experimentation, respect heritage and craftsmanship. As the digital environment is constantly evolving, an important part of the ethos of the manifesto is to encourage an agile mindset for both students and academics in order to develop the next generation of industry professionals to lead the change.

Operationalising the manifesto

This section summarises how the manifesto has been operationalised. This happened in conjunction with a shift in university teaching and learning policy, with a move to a block teaching system. This system is based on the premise of students studying one topic at once and results in a programme's content being taught as a series of consecutive 30 credit blocks (De Montfort University, 2024b).

This pedagogic shift was timely as the subsequent redesign and revalidation of programmes could be undertaken with the digital manifesto in mind. A timeline for implementation was developed, figure 2. This has 4 phases, consensus, strategic thinking and the development of the manifesto in phase 0.

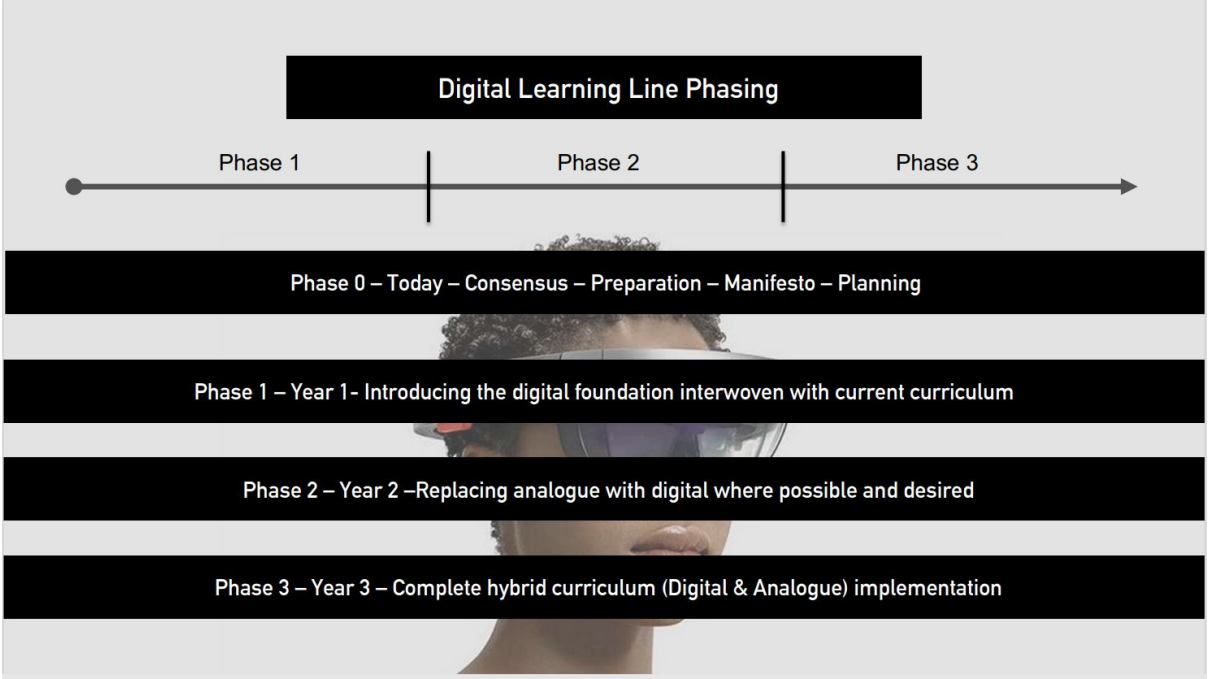

Figure 2: Timeline for implementation of the manifesto

The work in phase 1 included developing learning outcomes to consider all aspects of the manifesto, including the potential for project outcomes to be entirely digital. The subsequent revalidated programmes with their increased emphasis on digital transformation has led to new digital pedagogic thinking. The implementation is currently in phase 2 and 3, examples of activity that illustrate where the manifesto pledges are being addressed are illustrated in 3 case studies.

Equipping students to be part of the digital conversation.

This case study considers the integration of 3D design software into the pattern cutting and design development process. Its focus is to ensure students have the relevant knowledge and skills for future employment. With the rapid adopting of 3D digital design methods across many facets of the industry, the revalidated Fashion Design curriculum revised its pattern cutting teaching to incorporate digital pattern cutting throughout each year of the course, figure 3.

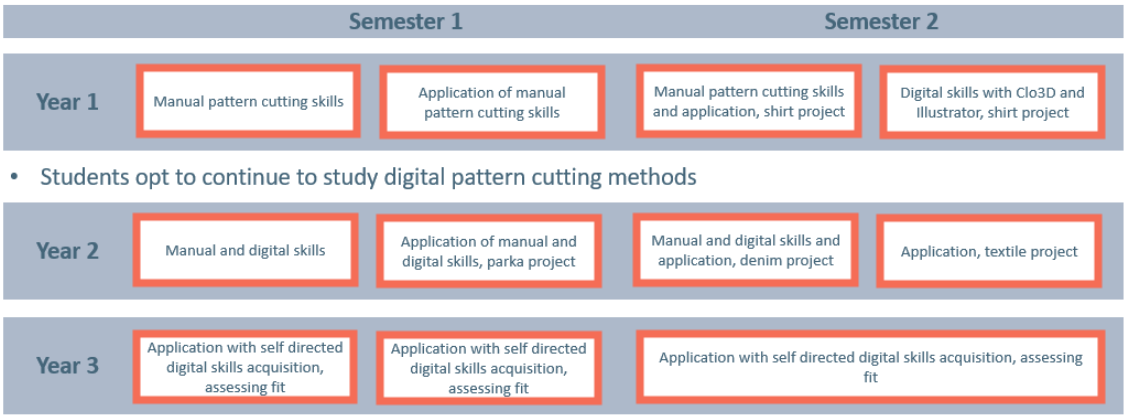

Figure 3: Integrating analogue and digital pattern cutting methods in the curriculum

First year Fashion Design students are introduced to the fundamentals of manual pattern cutting through a range of skills acquisition and application workshops alongside design, illustration and garment construction teaching and learning in their first 3 blocks. Digital pattern cutting methods are then introduced to all students in the fourth and final first year block. This teaching takes place, in person in a CAD Laboratory, and in a similar way to a studio set up with a group size of 20 students, figure 4.

Figure 4: Digital pattern cutting class using Clo3D in a CAD Laboratory

Here the pedagogy employed emulates traditional teaching methods with a library of digitised 2D pattern blocks and a virtual size 12 female avatar as a mannequin. Students use the 2D digitised blocks for a full range of pattern cutting examples in a similar way to their manual pattern cutting classes. The positive environmental impact of the 3D digital design process is highlighted throughout the sessions so that students appreciate the opportunity 3D digital design presents to reduce sampling and save material costs through the design process.

Following the mandatory content of the first year, students at year 2 and 3 have the option to continue to work in Clo3D alongside mandatory tuition in analogue methods. These students have access to further in person digital workshops to support with skills acquisition and application.

New frontiers for design

The second case study considers a novel design project whereby Virtual Reality (VR) was used as an immersive environment for design development to take place. The project had strong industry backing from adidas originals and Gravity Sketch, a leading company supplying a VR design application of the same name, used widely by automotive, apparel and footwear, consumer product and industrial designers, (Gravity Sketch, 2024).

This pioneering project was the first external client brief to use VR for footwear design in a university setting in the UK (Ross, 2024). Working with level 5 students, the industry clients had clear aims to develop a design talent pipeline with future facing skills currently rare within the current workforce. The client dedicated considerable time to mentoring students and instigated incentives for successful students, including the opportunity to present their final outcomes in VR to the adidas design team in Germany.

As the software was new to most students the initial weeks of the project were dedicated to acquiring new software skills and becoming used to the controls for a MetaQuest headset. This was followed by the project set by adidas originals team to use Gravity Sketch to reinterpret a shoe design from the adidas Originals archive and produce six product designs that reflect current trends and proportions. Through the six weeks of the project students developed their design practice, attended design tutorials in VR with industry mentors, supported by their tutors throughout. Their final ideas were 3D modelled and presented to adidas designers. An example of the final product presented in the LandingPad virtual environment with back up visuals can be seen in figure 5.

Figure 5: Final project outcomes, work produced by Skye Wicks.

Co-creating rules of engagement with generative AI

This case study explores the integration of generative AI into design research and pedagogy, focusing on co-creation between staff and students to establish rules of engagement for AI as a visualisation tool. Inspired by the early adoption of AI visualisation to reimagine design outcomes, the project emphasises collaboration and experimentation. (Beattie, 2024).

The study granted four students access to Midjourney, a generative AI platform, to support their individual collections by inspiring real-world designs through AI-generated visuals. Students experimented with prompts and AI outputs, embedding the generated visuals into their design process. The project was structured to critically evaluate this integration through a combination of student questionnaires and focus groups, allowing for an in-depth understanding of their experiences, insights, and the creative potential of AI.

FINDINGS AND ANALYSIS

The work to date has been evaluated through a series of meetings with the academic team who were part of the original manifesto development sessions. The key findings are as follows.

1. The community approach to developing the digital manifesto provided collective momentum for digital transformation. The manifesto workshops to collate academics' views on challenges, current skills, hardware and software requirements, pedagogic requirement enabled a series of the core competencies required for digital transformation to be developed and provided a supportive environment for development.
2. The study provides tangible insights into how digital tools improve workflow efficiencies and facilitate good practices in design education. As part of this process several academics have built advanced competencies in a variety of

software applications from Clo3D, AVA, Adobe Substance, Gravity Sketch through to Midjourney.

3. In the fashion and textile disciplines, digital integration requires maintaining practical analogue skills alongside digital innovation. A hybrid approach, where analogue and digital methods are combined is critical to preserving core competencies while embracing technological advancements.
4. The academic understanding of traditional pedagogic practice is important in the embedding of digital methods into the curriculum. In person synchronous teaching approaches have been employed which have been favourably received by students. This work has bolstered academic confidence in innovative teaching approaches and fostered dialogue around best practices.
5. The three case studies show that key aspects of the manifesto are being addressed; the importance of co-creation, embracing new frontiers and equipping students to lead the change. They have shown that new ways of hybrid working are evolving. This maybe a fashion design student working developing and modifying patterns in Clo3D while working on a physical toile, or a Fashion textiles student reverse engineering and problem solving to interpret photo realistic design research produced from prompts to AI to create real life product.
6. Industry engagement is important to drive digital transformation forwards, providing relevance and opportunities for the students, academics and universities.

DISCUSSION

This research highlights the critical intersection of digital transformation, education, and industry needs, underscoring the value of a manifesto-driven approach in guiding a School of Fashion and Textiles toward Industry 4.0 readiness. The findings demonstrate that the statements included within the manifesto can act as both a roadmap and a reflective tool for integrating emerging technologies into academic and professional practices. It also highlights that digital integration requires an emphasis to balance practical analogue skills content alongside digital innovation.

Integrating Digital Tools in Education

The operationalisation of the manifesto through case studies in 3D CAD, virtual reality, and AI-generated imagery illustrates how digital tools can revolutionize traditional workflows. This aligns with Beattie's (2024) observations regarding AI's transformative role in fashion design. By embedding these tools into curricula, the project has encouraged the development of digital mindsets necessary for both creative exploration and practical application, bridging the gap between educational objectives and industry expectations. Furthermore, this work emphasizes responsible and ethical use of AI, contributing to the broader discourse on institutional policy development around emerging technologies.

Digital transformation provides scope for pedagogic research in the integration and use of new technologies within design education. With appropriate ethics approval in place, universities can assess the efficacy of teaching approaches. Data can be collected to evaluate student learners' views on the project itself, its wider industry implications and future potential.

Aligning Academic Practices with Industry Demands

The collaboration with industry leaders, exemplified by partnerships with companies like adidas, has reinforced the imperative for universities to equip graduates with advanced digital skills. Industry engagement validates the manifesto's relevance and establishes academia as a testing ground for innovative software and workflows. These partnerships have demonstrated mutual benefits: students gain exposure to cutting-edge tools, industry leaders receive actionable feedback on software usability, and universities foster enhanced employability outcomes.

Sustainability and Digital Transformation

Digital transformation in fashion and textiles offers significant potential for addressing sustainability challenges. This research has explored how new modes of working, enabled by digital methods, can reduce the environmental impact of design processes. By integrating sustainability-focused practices, such as minimizing physical prototypes through digital visualization, students are prepared for roles in industries increasingly prioritizing green innovation. This aligns academic practices with industry trends, positioning graduates as contributors to sustainable design solutions.

Future Directions

The manifesto has proven to be a valuable guide for integrating digital technologies into design education, with further potential to be explored. Academic reflections suggest the need for ongoing refinement of the manifesto, particularly in the areas of accessibility, scalability, and long-term impact assessment.

Embedding ESD competencies into the curriculum is seen as a way to provide a robust framework for equipping students with the skills and mindsets necessary for navigating the complexities of Industry 4.0. By aligning academic practices with industry demands, this would work towards students being not only employable but also prepared to drive sustainable innovation within the fashion and textile sectors. This dual focus on employability and sustainability aligns with the transformative goals of digital education in a rapidly evolving landscape.

The manifesto approach has fostered interdisciplinary collaboration, encouraging innovative educational and research practices across various design fields. This

collaboration highlights the versatility of digital tools and their application across many areas, with the possibility for further interdisciplinary and collaborative work.

CONCLUSIONS

Overall, this research has demonstrated the potential of a manifesto-driven approach to bridge the gap between digital transformation and design education, ensuring that students are prepared for the challenges and opportunities of Industry 4.0 while contributing to sustainable and innovative industry practices.

The strong emphasis on co-creation fostered collaborations between staff, students and industry in the context of ever evolving technology. This encouraged a step change in mindset with a community of learners and educators enthusiastic to explore the potential of digital technologies.

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