



# **Innovation Funding for UK Fashion and Textiles**

**An overview of R&D mechanisms to support  
collaborative, industry-led academic research**

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**UNIVERSITY OF LEEDS**

# **Innovation Funding for UK Fashion and Textiles: An overview of R&D mechanisms to support collaborative, industry-led academic research**

**Rainton, S., Harris, J. and Russell, S. J.**

The authors wish to acknowledge the support provided by AHRC's Creative Industries Clusters Programme (CICP), incorporating the Creative Research and Development Partnerships the Business of Fashion, Textiles and Technology (BFTT) and the Future Fashion Factory (FFF).

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**This report is the third in a series of four reports based on joint research by the Business of Fashion, Textiles and Technology (BFTT), University of the Arts London and the Future Fashion Factory (FFF), University of Leeds.**

BFTT and FFF are part of the Creative Industries Clusters Programme (CICP), an £80 million initiative associated with the Industrial Strategy Challenge Fund, delivered by the Arts and Humanities Research Council (AHRC) on behalf of UK Research and Innovation (UKRI).

#### **The Business of Fashion, Textiles and Technology**

The Business of Fashion, Textiles and Technology (BFTT) is a £6 million creative research and development (R&D) partnership led by the University of the Arts London (UAL). BFTT operates at the intersection of design, STEM, cultural anthropology and business practices to support circular and sustainable collaborative research and development, led by industry. A transdisciplinary partnership, BFTT has provided R&D in collaboration with Loughborough University, University College London, Queen Mary University of London, the University of Leeds, the University of Cambridge, and the Victoria and Albert Museum. Key industry partners include leading fashion, wider apparel, and textile brands, online retailers, emergent design companies, sectoral business trade organisations, including the UK Fashion & Textile Association, the British Fashion Council, regional partnership from LEPs, the Greater London Authority (GLA), the London Legacy Development Corporation (LLDC), and the British Council. BFTT is part of UAL's Fashion, Textiles and Technology Institute (FTTI) based at the UAL East Bank campus at the Queen Elizabeth Olympic Park (QEOP). UAL FTTI convenes interdisciplinary expertise to deliver sustainable research and innovation and curriculum development across the global apparel and textile value chain, and adjacent sectors.

Find out more about the Business of Fashion, Textiles and Technology at <https://bftt.org.uk/> and UAL FTTI at <https://www.arts.ac.uk/uaf-fashion-textiles-and-technology-institute>.

#### **The Future Fashion Factory**

The Future Fashion Factory (FFF) is a £6.1 million industry-led, collaborative R&D programme led by the University of Leeds, which serves a large UK design and manufacturing creative cluster in fashion and textiles. FFF brings together designers, manufacturers and retailers, to co-develop and implement advanced textile and industrial digital technologies (IDTs) to create new processes and products, reduce lead times for product development, increase the UK's global competitiveness and support economically viable sustainable development across the industry. Led by the University of Leeds in partnership with the University of Huddersfield, the Royal College of Art and Manchester Metropolitan University, industry partners include the UK Fashion and Textile Association (UKFT), the Textile Centre of Excellence, and a network of over 500 businesses (SMEs and PLCs). Future Fashion Factory is part of the Leeds Institute of Textiles and Colour (LITAC) in the School of Design, a collaborative, multi-disciplinary

research institute, built on a 150-year history, that addresses global challenges in textiles, fashion and colour through research and innovation, as well as teaching.

Find out more about Future Fashion Factory at <https://litac.leeds.ac.uk/about/> and LITAC at <https://litac.leeds.ac.uk>.

This research is a collaborative initiative made possible by the Creative Industries Clusters Programme<sup>1</sup>, and the Fashion Demonstrator programme, supported by the Arts and Humanities Research Council (AHRC) and the Department for Culture, Media and Sport (DCMS).

<sup>1</sup> AHRC. (2024). Who AHRC is. Retrieved from <https://www.ukri.org/who-we-are/ahrc/who-we-are/>

|          |                                                     |           |
|----------|-----------------------------------------------------|-----------|
| <b>1</b> | <b>Foreword</b>                                     | <b>7</b>  |
| <b>2</b> | <b>Executive Summary</b>                            | <b>9</b>  |
| <b>3</b> | <b>Background</b>                                   | <b>11</b> |
| <b>4</b> | <b>Cluster Mechanisms</b>                           | <b>15</b> |
| <b>5</b> | <b>Business of Fashion, Textiles and Technology</b> | <b>19</b> |
| 5.1      | BFTT Methodology                                    | 20        |
| 5.2      | BFTT 'KTP Type' R&D Programme Design                | 21        |
| 5.3      | BFTT 'KTP Type' R&D Mechanism                       | 22        |
| 5.4      | BFTT R&D Case Studies:                              | 25        |
| 5.4.1    | Ananas Anam                                         | 25        |
| 5.4.2    | AWAYTOMARS                                          | 27        |
| 5.4.3    | Doppelhaus                                          | 29        |
| 5.4.4    | iinouiiio                                           | 31        |
| 5.4.5    | Project Plan B                                      | 33        |
| 5.4.6    | Segura                                              | 35        |
| <b>6</b> | <b>Future Fashion Factory</b>                       | <b>41</b> |
| 6.1      | FFF Methodology                                     | 42        |
| 6.2      | FFF Responsive R&D Programme Design                 | 42        |
| 6.3      | FFF Responsive R&D Mechanism                        | 45        |
| 6.4      | FFF R&D Case Studies:                               | 47        |
| 6.4.1    | Abraham Moon                                        | 47        |
| 6.4.2    | Amphico                                             | 49        |
| 6.4.3    | Hylo Athletics                                      | 51        |
| 6.4.4    | Joshua Ellis                                        | 53        |
| 6.4.5    | Materra                                             | 55        |
| 6.4.6    | Ponda                                               | 57        |

|          |                                                                                        |           |
|----------|----------------------------------------------------------------------------------------|-----------|
| <b>7</b> | <b>Common Challenges and Opportunities</b>                                             | <b>65</b> |
| 7.1      | A Common Language, Aims and Objectives                                                 | 66        |
| 7.2      | Brokerage Requirements                                                                 | 68        |
| 7.3      | Skills Development                                                                     | 69        |
| 7.4      | Changing Legislative and Political Landscape                                           | 70        |
| <b>8</b> | <b>Recommendations</b>                                                                 | <b>73</b> |
|          | <b>Special Thanks</b>                                                                  | <b>77</b> |
|          | <b>References</b>                                                                      | <b>79</b> |
|          | <b>Tables</b>                                                                          |           |
| Table 1  | High Level comparison of fashion and textile funding mechanisms                        | 16        |
| Table 2  | FFF Calls – launch dates, number and distribution of awards, call type                 | 43        |
| Table 3  | Overview of FFF Responsive R&D structure showing the three levels of funding available | 44        |



# 1 Foreword



Dr Joseph Houghton undertaking fabric coating tests at Virustatic. © Alys Tomlinson

## Foreword



When the Arts and Humanities Research Council (AHRC) and the Industrial Strategy Challenge Fund came together to develop the Creative Industries Clusters Programme (CICP) it was a pivotal moment for the creative sector. For the first time, not only was there large scale funding available to support growth across the creative economy, but there was also an understanding that there was something different about the way that creative industries operated versus STEM-driven sectors. The embedding of the commissioned R&D process within all CICP-funded clusters was a step change, as it provided each cluster with the freedom to work out what would be most effective within their industry sector ecosystem. Our sector, UK fashion and textiles, was fortunate to benefit from two targeted programmes of collaborative, industry-led research, one based in Leeds (FFF) and the other in London (BFTT).

It has been a real pleasure for UKFT to have been involved from the outset in programme delivery, but also for me personally to have witnessed the way in which initial cynicism about industry-academic partnership development has changed, and interest has grown over the last six years. As a sector we started the journey with a will to change how we approached innovation, and a willingness to experiment with new ways of working. For this reason, UKFT was happy to provide support to the BFTT and FFF programmes as they developed, specifically by serving on the FFF Steering Group, Programme Management Group and Chairing the Cluster's Responsive R&D Investment Committee. This gave important oversight into how delivery mechanisms were progressing and crucially being received by our industry members on the ground.

The outcomes have been outstanding. We now have a sector that is more inclined to think about innovation partnerships with universities in a positive light, and that has built productive relationships with the UK's diverse, and nationally distributed knowledge base. Highly effective collaborative R&D funding mechanisms have also now been tried and tested, specifically for the fashion and textile industry. This report outlines those mechanisms and provides detail on just a fraction of the truly impactful projects that have been delivered over the period. Without this head of steam building through CICP investment, the UKRI Circular Fashion and Textile Programme, which includes such vital elements as the sorting and recycling demonstrator (ACT UK), Circular Fashion Innovation Network (CFIN) and the Network Plus in circular fashion and textiles, would most probably never have been developed in the way that it has. The trilateral arrangement between AHRC, Natural Environment Research Council (NERC) and Innovate UK is a very powerful reminder of how far the CICP, and particularly the evidence generated through the deployment of the two commissioned R&D mechanisms, has brought us.

**Adam Mansell**  
Chief Executive Officer  
UKFT Fashion and Textile Association



# 2 Executive Summary

Regenerative cotton grown in India by farmers in collaboration with Materra. © Materra

## Executive Summary

This report focuses on the commissioned R&D mechanisms that formed an integral part of all nine Creative R&D Partnerships (CRDPs) funded by the Creative Industries Clusters Programme (CICP). The two fashion and textile clusters, the Business of Fashion, Textiles and Technology (BFTT) and Future Fashion Factory (FFF) developed different bespoke mechanisms to facilitate collaborative R&D and innovation for their target cluster.

Data presented in this report was derived from both formal and informal project reports. It includes a mixture of interviews with programme management participants, feedback from participating businesses at the time of project delivery, reflections from members of both investment committees and funding recipients post-delivery. A small number of industry case studies supported by the two clusters are included as examples of tangible outcomes resulting from the funded interventions.

Based on the findings of the BFTT and FFF programmes, recommendations address the following:

- Learning to inform future investment mechanisms, including requirements for multi-disciplinary co-creation of innovative concepts.
- Barriers and mitigating approaches to maximise engagement with future programmes.
- Requirements for brokerage and wraparound business support to maximise impact.
- Structuring of interventions to facilitate commercialisation of project outcomes.
- Access to a balance of revenue and capital funding.
- The need for whole supply chain and multiple stakeholder engagement to enable coordinated approaches to sector-wide challenges.
- Considerations for futureproofing fashion and textile sectoral skills provision.



# 3 Background



From left to right, Franki Brewer, Steph Rolph and Jessica Garvey Birch, part of the R&D team for woven textile studio Dash & Miller. © Alys Tomlinson

## Background

### About the Creative Industries Clusters Programme

Launched in October 2018, the Creative Industries Clusters Programme (CICP) was an innovative and disruptive funding mechanism for, and informed by, the creative industries. The purpose of the initiative was to support innovation across the creative industries through collaborative research and development (R&D), improving access for small to medium enterprises (SMEs), as well as competitiveness to bolster the sector's contribution to the UK economy. The CICP's approach was designed to engage the UK's creative industries in ways that other funding mechanisms had previously struggled to achieve. The programme set out to encourage collaborative R&D between academic and industry partners, fostering industry-led innovation to accelerate growth of the UK's creative economy.

Led by the Arts and Humanities Research Council (AHRC)<sup>1</sup>, funding for the CICP programme was derived from the Industrial Strategy Challenge Fund (ISCF)<sup>2</sup>. The ISCF investment, informed by sector deal considerations and championed by Sir Peter Bazalgette<sup>3</sup> enabled the CICP to ring-fence 'Commissioned R&D' funds to be distributed across existing UK creative clusters:

"Whilst Innovate UK have funded a number of innovative creative projects ..., a review of the first year or foundation calls suggests only 2% of the total awards allocated went to creative projects. There are a variety of reasons why creative projects were underserved in this area (for example, SMEs are often unfamiliar and inexperienced with grant bidding processes). But more should be done to ensure the creative sector can and does bid for support and that this percentage rises dramatically in future years both from the ISCF and from wider Innovate UK funds". – Sir Peter Bazalgette<sup>4</sup>.

The CICP covered a broad spread of creative industries including screen and performance, media production, fashion and textiles, gaming, and storytelling. These areas were represented by the creation of nine Creative R&D Partnership (CRDPs).

Each CRDP had the opportunity to design its own, customised approach to supporting industry within its creative cluster, including mechanisms for distributing collaborative R&D funds. The purpose remained the same across all clusters to facilitate academic-industry collaboration that fostered industry-led innovation, and which supported development of the UK's creative economy. In total, £80 million in funding was awarded across the nine CRDPs (2018-24).

<sup>1</sup> AHRC. (2024). Who AHRC is. Retrieved from <https://www.ukri.org/who-we-are/ahrc/who-we-are/>  
<sup>2</sup> GOV.UK. (2017). Business Secretary announces Industrial Strategy Challenge Fund investments. Retrieved from <https://www.gov.uk/government/news/business-secretary-announces-industrial-strategy-challenge-fund-investments>  
<sup>3</sup> Bazalgette, P. (2017). *Independent Review of the Creative Industries*. Retrieved from <https://apo.org.au/sites/default/files/resource-files/2017-09/apo-nid198251.pdf>  
<sup>4</sup> *Ibid* p.29



## Background

The BFTT and FFF academic-industry partnerships established different initiatives to support fashion and textile (F&T), wider apparel and related technology businesses with the primary objectives being to:

- Enhance the resilience and capacity of F&T businesses and enable SMEs to realise opportunities for business growth and access new markets.
- Develop new product, process and service innovations to increase competitiveness.
- Reduce environmental impacts and create new market opportunities consistent with sustainable development through creative material and product design, manufacturing and waste management.
- Encourage innovation in F&T skills (business/enterprise, technology, design).
- Increase research capacity in both Higher Education Institutions (HEIs) and industry through industry-led collaborative R&D.
- Develop new funding mechanisms to support industry-led R&D, including engagement of businesses without experience of collaborative R&D with University partners.
- Encourage Science, Technology, Engineering, Arts & Humanities, and Mathematics (STEAM) and Design collaboration, removing traditional disciplinary siloes, and enabling greater research impact across the F&T industry.

## Background



Denim Wash Lab R&D facility at Blackhorse Lane Ateliers.



SeFF Fibre's cottonisation process.



# 4 Cluster Mechanisms



Footwear R&D examples as part of the BFTT SME R&D Showcase at Plexal, 2024. Yana Kasa ©

## Cluster Mechanisms

This report details the findings from the two fashion and textile (F&T) clusters which developed complementary methods of working with creative businesses to facilitate collaborative R&D. *Table 1* summarises the different funding support mechanisms deployed by each cluster. While not a comparative analysis, findings listed are a representation of the different but complimentary approaches of each cluster.

|                                                                 | Future Fashion Factory (FFF)                                                                          | Business of Fashion, Textile and Technology (BFTT)                                                                                                                                                                                                 |
|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Total R&D Funding Awarded                                       | £4.25 million                                                                                         | £4.1 million                                                                                                                                                                                                                                       |
| R&D Funding Leveraged (from Commissioned R&D only) <sup>5</sup> | £2.70 million                                                                                         | £2.51 million                                                                                                                                                                                                                                      |
| Number of Calls                                                 | 6 funding calls + 5 supporting core research thematic strands practice and international communities. | 3 funding calls + 5 collaborative SME R&D projects.                                                                                                                                                                                                |
| Number of Awards                                                | 55 awards over 6 funding calls + 5 supporting core research theme strands                             | 20 high value awards over 3 funding calls. + 5 collaborative SME R&D projects (involving 14 SMEs)                                                                                                                                                  |
| Eligibility Criteria                                            | SMEs / Start-ups eligible                                                                             | SMEs / trading min. 2 yrs.                                                                                                                                                                                                                         |
| Funding Available                                               | Open Calls. 3 Levels of funding (Calls 1-5) PoC only (Call 6), project duration of 3-12 months.       | Open Expression of Interest (EOI) Call. Up to £175k, for up to 18-month R&D projects.                                                                                                                                                              |
| Industry / Academic staff split                                 | Industry-led with in-kind contributions. Mandatory academic engagement, no minimum level prescribed.  | Industry-led, with in-kind staff contributions. Mandatory academic engagement with minimum of 1 x 0.5 FTE PDRA or industry equivalent level of experience, and academic mentor/s. No minimum level prescribed - allocated as required per project. |
| Cluster connectivity                                            | All projects required a geographic cluster connection to the Yorkshire & Humber region.               | All projects required to align to BFTT identified F&T challenges. UK wide EOIs were invited to benefit from the expertise of the emergent East London F&T R&D Cluster.                                                                             |

<sup>5</sup> Leverage calculation includes achieved R&D grant funding, in-kind company matched funding and value of staff time spent on the project.

|                          |                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                  |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Development Process      | Brokerage support provided to assist businesses with developing applications, connecting with other academic/industry partners and signposting to alternative R&D providers, as appropriate. | Following EOI, shortlisted projects undertook a 3-month bespoke and 1-2-1 application development process to achieve a cost viable R&D project which included establishing appropriate support/ capital investment. Unsuccessful SMEs were signposted to alternative funding opportunities and/or R&D providers, as appropriate. |
| Award Process            | Independent Investment Committee, including university commercialisation team and industry partners.                                                                                         | Final investment pitch to Commissioning Panel. 12 members of the panel represented industry expertise spanning innovation and sustainable R&D and HEI business development and commercialisation (LU and UAL).                                                                                                                   |
| Completion Rate / Status | 53 completed R&D projects (70 beneficiaries)                                                                                                                                                 | 25 complete R&D projects (113 SME beneficiaries)                                                                                                                                                                                                                                                                                 |

Table 1: Overview of Support Mechanisms Across the FFF and BFTT Clusters

Whilst both CRDPs adopted different approaches to the distribution of R&D funds, similarities were apparent in the industry feedback regarding the challenges and barriers experienced by the sector.



# 5 Business of Fashion Textiles and Technology

The Business of  
Fashion, Textiles &  
Technology Partnership



Panelists at the BFTT Making Sustainable Change conference. UAL Fashion, Textiles and Technology Institute ©

## 5.1 BFTT Methodology

The Business of Fashion, Textiles and Technology (BFTT) CRDP methodology was in part informed by a report commissioned by UAL (2016-17), from BOP consulting, a specialist in culture and creative economy<sup>6</sup>, to establish an East London Fashion Cluster (ELFC) that would support wider innovation and investment in fashion and textile related technology interests. Stakeholders included the CEOs of UK Fashion and Textiles (UKFT) and British Fashion Council (BFC), Greater London Authority (GLA), London Legacy Development Corporation (LLDC), London Boroughs across East London and the Upper Lea Valley, and prominent F&T industry leaders. With UAL's new East Bank campus for London College of Fashion (to host approximately 6500 students), as part of an £800m public-private partnership at the Queen Elizabeth Olympic Park (QEOP, 2023)<sup>7</sup>, the BFTT set out to convene a new set of QEOP higher (HE) and further (FE) education partners, to develop and deliver a Design led STEM R&D programme for F&T, and establish a special purpose vehicle (SPV) to maintain F&T R&D for the longer term. UAL's Fashion, Textiles and Technology Institute is the emergent SPV and legacy to the AHRC CICP funding award.

BFTT's methodology also focused on development of a 'KTP type' R&D programme, co-designed by the CRDP, with the aim of embedding advanced high-level interdisciplinary skills in SMEs, optimising provision for knowledge exchange and enduring capability. The Knowledge Transfer Partnership (KTP) scheme (operational since 1975)<sup>8</sup> provided the inspiration and methodology for UAL's BFTT CRDP proposal (2017/18). The scheme, led by Innovate UK (formerly the Technology Strategy Board), is the UK Government's key initiative designed to support collaboration between HEIs and businesses. KTPs involve a three-way partnership between a business, a UK University, and a recently qualified graduate. It offers a company the chance to collaborate on a business opportunity, idea or innovation for a period of 12-36 months. A 2015 evaluation identified numerous benefits for each of the three parties involved, with approximately £7.5-£8 of net additional gross value added (GVA) generated for every £1 of KTP grant funding<sup>9</sup>.

However, despite the longstanding success of the scheme across many business sectors, it has been less successful in attracting the participation of SMEs from the wider creative industry sectors. Only 4% of all KTP programmes undertaken between 1982 and 2014 were in the field of Design<sup>10</sup>. Between 1989 and 2016 just 17 funded partnerships explicitly focused on fashion, apparel, textiles and related technologies, out of over 8,000 KTP projects<sup>11</sup>.

<sup>6</sup> [https://www.fashion-district.co.uk/wp-content/uploads/2018/09/170314\\_ELFC\\_SummaryReport\\_PRESSQUALITY\\_FINAL.pdf](https://www.fashion-district.co.uk/wp-content/uploads/2018/09/170314_ELFC_SummaryReport_PRESSQUALITY_FINAL.pdf)

<sup>7</sup> <https://www.arts.ac.uk/colleges/london-college-of-fashion/about-lcf/lcfs-move>

<sup>8</sup> IUK. (2025). Empowering innovation by connecting businesses with experts. Retrieved from <https://iuk-ktp.org.uk/>

<sup>9</sup> Siora, G. e. a. (2015). *KTP Programme: The Impacts of KTP Associates and Knowledge Base on the UK Economy*. Retrieved from Birmingham: <https://library.net/document/qop8komz-ktp-programme-impacts-ktp-associates-knowledge-base-economy.html>

<sup>10</sup> Ibid

<sup>11</sup> Harris, J. (2018). The Business of Fashion, Textiles and Technology CRD Partnership. In: Arts and Humanities Research Council.



Preliminary research undertaken by UAL informing the BFTT CICP grant application included feedback from F&T SMEs identifying the following as key barriers to KTP for their businesses:

- The high level of match funding required (circa 33%).
- Limited time to apply for and manage a KTP project/placement.
- The complex application process.
- Limited allowance for state-of-the-art (SOA) capital and equipment costs, prohibitive to achieving meaningful R&D.
- Challenges identifying appropriate HEI and/or industry partners without established links to relevant expertise.
- Considered in general a restrictive and prescriptive scheme, with alienating language and terminology<sup>12</sup>.

## 5.2 BFTT ‘KTP Type’ R&D programme design

The design of the BFTT SME R&D Programme addressed the issues outlined with the feedback received, drawing on aspects of the KTP programme that are considered key strengths to ensure that it was accessible to SMEs across the F&T sector. The resultant scheme involved a similar three-way partnership between businesses, recent graduates and HEIs with some notable differences:

- Targeted particularly at small and micro enterprises in the F&T sector.
- More intensive academic and business support from the host HEI partnership at the application stage.
- A smaller match fund contribution required from participating businesses (10% compared to 33% for KTP).
- Capital spend was allowed. BFTT invested a total of £426,980 in 46 types of SOA facilities embedded into SMEs to support their R&D.
- A focus on supporting SMEs whose innovation R&D involved the development of more circular and/or sustainable practices, systems and processes.
- The Project Lead at Post-doctoral level, or industry equivalent, embedded in the SME offered more established skills and experience to the company, leading on the development and management of the project. This role was contracted by the HEI, working in collaboration with the SME.
- Options for partnership applications between two or more businesses, including larger businesses.
- Unsuccessful applicants with viable concepts were offered relevant specialist consultancy support to help progress ideas in preparation for other types of funding.
- On-going regular support provided SMEs with a new-found capability to secure follow-on funding.

## 5.3 BFTT ‘KTP Type’ R&D mechanism

### Application

The application process to the BFTT R&D programme involved a 2-stage process; an initial Expression of Interest (EOI), with those short-listed given intensive bespoke business and academic support (circa 40 hours of one-to-one) to assist in the development of a viable R&D proposal. This co-design process helped the applicants determine a longer-term strategy for their R&D project, produce a fully costed proposal, and fully understand the level of commitment (time and resources) required.

While considered stringent, the SMEs appreciated the level of support from the academic and business support team and the Commissioning Panel which included highly experienced industry sector specialists conversant with the sustainability imperative, who fully understood related business and innovation challenges at every level. Additionally, this process gave some businesses the opportunity to amend or complete business plans and other key governance documents, later proving invaluable when making follow-on funding proposals.

The shortlisted businesses presented their final project proposals to the BFTT Commissioning Panel of industry and academic experts. This panel ultimately determined the final selection, and award type (size of grant, length of project, etc.), and were engaged in the ongoing R&D project review processes.

Successful R&D projects received: a grant; a 0.5 FTE Project Lead (PL) Early Career Researcher (ECR)-level post to manage the project throughout; an Academic Mentor/s (AM) for approx. 8 hrs per month providing specialist advice (both in part structured, and flexible); and extensive support from the SME R&D Programme Manager and R&D team throughout the project timeline.

- A total of 234 firms applied to the programme across 3 separate calls.
- 91% of applications were from micro enterprises.<sup>13</sup> 98% had less than 50 employees.
- The age of businesses ranged from start-ups to 286 years, with 57% being set up in the last 5 years. 85% percent of applicants were limited companies, 14% sole traders and 1% partnerships.
- Most had a small turnover, with 62% loss-making or just breaking even, and only 13% having a turnover of £250,000 or more.
- The programme attracted a diversity of applicants. 28% of owner managers were from Black or Asian minority ethnic (BAME) communities, 61% were women, and 13% had a disability.
- Expressions of Interest were invited from across the UK. Whilst most of those responding to the first call were from London and the southeast largely due to the primary geographic location of the CRDP, wider

<sup>13</sup> European Commission, Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises, EU Recommendation 2003/361 C.F.R. (2003).



promotional activities led to 42% of applications from calls 2 and 3 coming from outside the capital and covered every region of the UK.

For most of the SMEs selected for support, the BFTT project was their first formal Knowledge Exchange (KE) project. Any previous links with HEIs had largely been through personal contacts or local institutions, and had been limited to hiring ad hoc, individual experts on a consultancy basis (with mixed results), or through hosting student placements or PhD students on a short-term basis. Not knowing how to find the right specialist, type of business support, appropriate level of expertise, or establish the necessary ecosystem that R&D usually requires had been a key barrier to the development of meaningful R&D partnerships. The BFTT therefore was considered by SME participants to offer a vital gateway, helping the SMEs navigate the HEI system and introducing them to academics with the expertise they needed to help develop their innovation.

*“The BFTT opened the door to a network of academic resources, providing access to both knowledge and new technologies otherwise difficult to access. BFTT also brokered connections to the right expertise which helped the company to focus and be more efficient on delivery of the R&D.”* – **Bruno de Penanster, CFO, Ananas Anam**

#### Embedding Skills

The BFTT programme identified through the ELFC report captured the desire from F&T businesses to access the most up to date high-level skills, state of the art (SOA) facilities and research capability to meet pressing sustainability challenges and provide opportunities to develop more environmentally conscious SOA products and services.

Assembling a team or ecosystem of support with the right set of skills and behaviours was essential to the success of each of the R&D projects. Each of the SME project team members outlined the key set of complimentary skills required. The BFTT programme involved a pool of 65 interdisciplinary academics from across the CRDP. From this pool, approximately 20 academics worked directly with the SMEs as Academic Mentors (AMs) to co-design, and ultimately oversee delivery of the R&D projects. The AMs required a strong overview of the specific subject area, but also a broad range of academic and industry links that could offer additional expertise where needed and allow opportunities for academic outputs and further potential commercial partnerships to be identified. Once SME projects were shortlisted for support, AMs were involved in the co-design of the R&D with the SMEs, a process which proved to be critical to ensuring the timeliness, and success of each project.

The BFTT ‘KTP type’ R&D model provided 27 Early Career Researcher (ECR) employment opportunities, in the form of R&D/Project Lead (PL)

roles. The PLs were embedded into the businesses and project delivery for significant periods of time. This level of capability fast-tracked specialist high-level delivery across the BFTT SME cohort, enabling a level of knowledge exchange that has consequently resulted in long-lasting research partnerships beyond the lifetime of the original R&D projects. Each of the PLs also benefitted from the attainment of project management and technical skills, direct understanding of industry challenges, in addition to expertise through development of more sustainable products, services, and commercial practices – strengthening their future career prospects in both industry and academic contexts.

Further deployment of the BFTT ‘KTP type’ R&D methodology and application of skills has been achieved through the co-design of a parallel programme commissioned by the British Council, a partner at the QEOP, which has supported a further 17 UK and 20 international SMEs working collaboratively to date (2021-2025).



Fibre and coating testing at Virustatic to create the Virustatic Shield®.

## 5.4 BFTT R&D Case Studies

The following section provides case studies of a small number of funded R&D projects. These case studies have been selected to demonstrate the breadth of expertise required to undertake R&D, while demonstrating the journey of learning, the challenging nature of cutting edge and unknown R&D, and expected and unexpected successes encountered by businesses and researchers through the projects.

### 5.4.1 ANANAS ANAM

#### Optimisation of material design and manufacture to provide a higher quality Pinatex material

Both environmental and social sustainability are at the core of Ananas Anam's business model. Using plant waste from pineapple farming in the Philippines, which would otherwise be burnt or left to rot, Ananas Anam has created a textile called Pinatex. The manufacturing process not only minimises waste and harmful emissions from burning plant matter, but is also designed to create additional income and employment opportunities in pineapple farming communities.

Through BFTT Ananas Anam sought to improve the finishing process and technology for Pinatex to refine the product for market. After consultation with interdisciplinary academic experts, it was decided that the project should focus on testing the inner structure of the material, to establish whether this could be altered to improve the finishing.

New processes were tested to alter the inner structure of the Pinatex. This included the application of a technology on the material to strengthen it. This gave Ananas Anam insight towards future material developments and future market options. **The R&D optimised the manufacturing process to provide a more homogeneous, and higher quality Pinatex material. A key research outcome is the reduction of the weight of the Pinatex material, with an improved finish, reducing the production cost, which will have a positive impact on product design and development and could reduce shipping costs.**

The outcome from the R&D programme unlocked further funding for Ananas Anam. The BFTT team was granted an Innovate UK fund under a special COVID-19 programme. The sustainable innovation fund sought development of sustainable alternatives for PPE: biodegradable wipes and reusable masks made using the pineapple leaf fibre. Sustainable sterilisation methods for the use of pineapple leaf fibres in medical and hygienic applications was also researched. The total investment was c.£250k (£214k from Ananas Anam and £36k from UAL); for a further 9-month R&D programme.

#### Key Outcomes and Impact

- A higher quality, lighter and more lucrative material finish and overall product.
- An increased material strength that was not in scope, which has provided opportunity for future R&D development and new market applications.
- Reduced production and shipping costs.
- TRL increase: from 6 – 9 (increase by 3 TRL).
- MRL increase: from 7 – 8 (increase by 1 MRL).
- Follow-on funding to develop a new low-impact yarn resulting in 'Piñayarn'
- Yarn development is entirely novel, opening up numerous opportunities, including in footwear sectors.



Pinayarn, yarn created from pineapple leaf fibres.



The stages of creating Pinatex, a leather alternative made from pineapple leaf fibres.



### 5.4.2 AWAYTOMARS

#### Using AI to develop a co-creation design platform to transform the process of fashion design

Digital methods and tools such as AI and machine learning offer vast potential to contribute to the design process by tapping into the creative potential of consumer and user communities. While such technology has been embraced across almost all sectors, there has been a slower uptake in using such technologies in the development of textile and apparel products.

Almost a decade ahead of the current AI boom, AWAYTOMARS set out to use AI to radically transform the apparel design process. In 2015 the company developed an innovative collaboration platform as a proof of concept to support crowd participation and co-creation in the fashion design and innovation process.

The platform enabled users to engage in co-design processes involving a global community of over 15,000 members. By 2019 AWAYTOMARS aimed to take the business concept to the next level. This required a more sophisticated co-creation tool within the platform that would allow users to participate in design requests and co-working in a more user-friendly and transparent way.

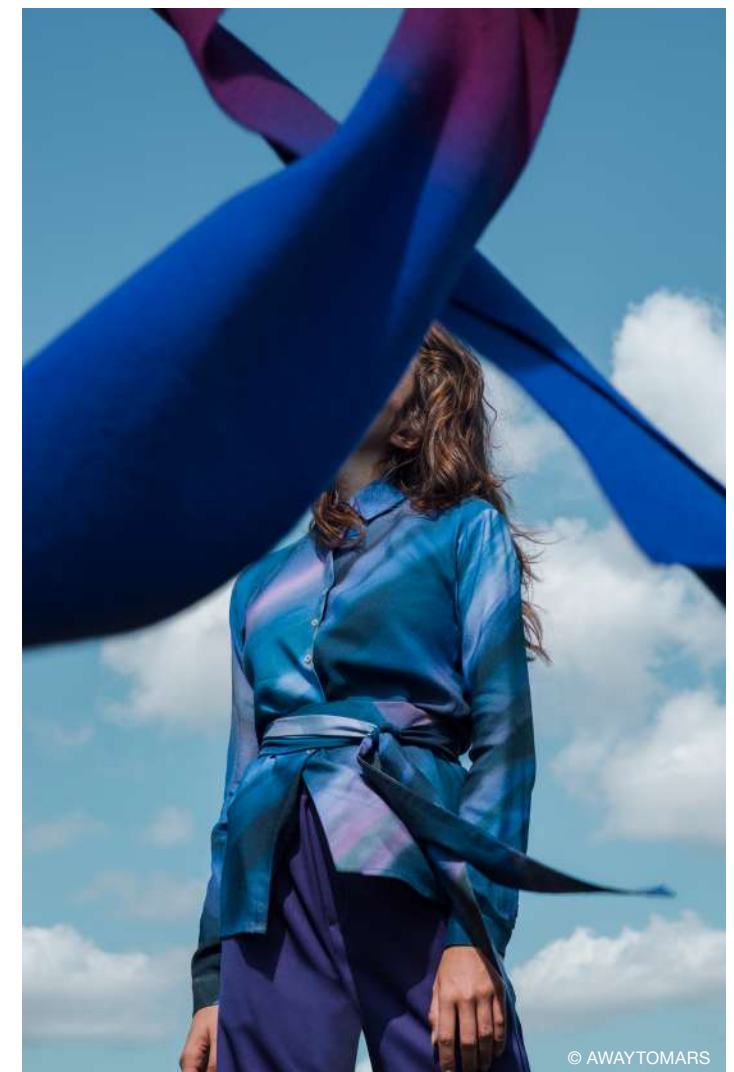
**The R&D project enabled collaboration with a specialist AI SME, Viapontica, to develop a minimum viable product (MVP), which resulted in a unique and ambitious project outcome. Viapontica, an Edinburgh-based SME, was also a participant of a different CRDP, Creative Informatics, led by Edinburgh University, illustrating effective collaboration across the CICP.**

Research conducted during the project explored the potential of AI for different elements of the design process. This included helping the designer create less wasteful garment shapes that used less fabric, while also providing a more bespoke consumer-facing design process. The research focussed on the different AI techniques that it would be possible to use, train and integrate in a real-time web-based app. Student teams across UAL and Edinburgh University helped to develop garment wireframes and create new bespoke high-resolution design datasets.

*“Technology offers huge potential to the creative industries... Computers can generate an infinite number of ideas, we want to harness the power of AI to facilitate the creative process.”* - **Alfredo Orobio, founder & CEO, AWAYTOMARS**

#### Key Outcomes and Impact

- A real-time platform and MVP ‘Supernova’ enabling users to experiment, share and work together to design and develop new creative works.
- Gaming elements that can be incorporated into the platform were developed and tested, including a pioneering reward and recognition system motivating co-creation.
- Development of pitch for investors and partners which attracted interest from established large-scale design and manufacturing companies.
- TRL increase: from 0 – 3 (increase by 3 TRL) resulting in a working interactive MVP.
- A wider BFTT collaboration with specialist SMEs Happy Finish (XR), Numerion (Physics-based dynamics simulation software), Holition (UX design), Maria Grachvogel (Fashion Design), MoveAI (multi-camera motion capture) and the V&A Museum (cultural heritage experiences), provided an opportunity to showcase the MVP prototype at the V&A Museum in South Kensington (2023).



AWAY TO MARS Chasing Clouds collection, created in collaboration with numerous designers.

### 5.4.3 DOPPELHAUS

**Development of a fully traceable 100% British wool supply chain enabling niche fabrics to be manufactured at scale in the UK.**

Composite materials developer Doppelhaus is a micro enterprise seeking to explore the potential of British wool in the production of innovative, non-woven, sustainable textiles. In the 1940s sheep's wool made up 12% of all UK textiles, but British mills finally fell into decline as cheaper imports flooded into the UK from the early 1960s.

British wool is viewed as 'coarse' compared to fine Merino wool imported from Australia and New Zealand. For many UK sheep farmers, wool is a waste product with its value so low that tonnes are burned or buried after shearing annually. The few remaining mills in the UK are often reluctant to undertake small runs of yarn/textile production, particularly with unknown fibres, making it difficult for SMEs to produce prototype new designs.

**The R&D project lead extensively mapped British wool supply chains to find producers that would enable development of a fully traceable 100% British wool supply chain allowing Doppelhaus fabrics to be manufactured at scale in the UK.**

Using a novel nonwoven manufacturing process, 'Cloudwool' is a lighter, more flexible felt fabric suitable for use in a wide range of apparel. The R&D involved development of the material to achieve a strong aesthetic and functional appeal at an accessible price point. Doppelhaus secured new partnerships with SMEs keen to work with their British wool product, including a partnership with Grenson Shoes, and development of a novel shoe product, M.I.E. Cloudwool Sneakers.

**Key Outcomes and Impact**

- Development of novel UK wool-based material innovation.
- Generating demand for an undervalued fibre, providing farmers with increased potential revenue, and minimising waste.
- Reviving interest in UK wool materials meeting environmental imperatives, and highlighting onshoring opportunities.
- Supporting development of novel partnerships and product development (Grenson Shoes).
- Addressing circularity, recycling, dying and traceability practices.
- TRL increase: from 5 – 9 (increase by 4 TRL).
- MRL increase: from 3 – 5.5 (increase by 2.5 TRL).



Creation of Cloudwool using 100% traceable British wool.



Cloudwool trainer, collaboration between Doppelhaus and Grenson launched in Spring 2023.



5.4.4 IINOUIIO

Recycling of high value pre- and post-consumer textiles to prototype better quality yarns and materials

Established in 2019, iinouiiio set out to address a gap in the market providing British textile manufacturers with quality recycled materials consumers are demanding. 200 years ago-the recycling of textile waste, or resource, in the north of England was known as ‘shoddy’. Shoddy, created in 1830 by Benjamin Law, in Batley, Yorkshire, was an important part of the UK textile industry with the manufacture of recycled textiles, particularly in the Yorkshire region. Recycled fibres were cheaper than virgin wool and for decades the industry thrived. By the 1970s mills began spinning higher value yarns, which the shoddy machinery could not process. The cost of incorporating recycled waste yarn into fabrics became uneconomic and the last of the shoddy businesses closed in 2020.

With a growing global demand for sustainable and circular fibres and processes, and a strong heritage from the shoddy industry, iinouiiio saw an opportunity to revive the Yorkshire based textile recycling industry. **The case of iinouiiio suggests that research and development, coupled with the development of new technologies, growing consumer and business interests and sustainability imperative, can support the revival of heritage industries to solve current environmental challenges and related problems across F&T sectors.**

Through re-use of wool yarn, iinouiiio’s R&D highlighted the potential to generate significant savings in energy, water and effluent compared to using virgin wool yarns. Freshwater consumption and effluent production are greatly reduced because processes such as raw wool scouring and dyeing do not need to be repeated. Methane gas production resulting from decomposing woollen and synthetic garments and factory waste usually dumped into landfill sites is also reduced, limiting harmful pollutants released into the atmosphere and environment.

Specialist academic and industry experts worked alongside iinouiiio’s CEO Dr John Parkinson. Drawing on his decades of industry insight and experience, the R&D enabled development of new and more commercially viable high value fibres created from knitting waste, providing new yarns for knitting and woven fabric. Six months into the 15-month project, the project team had developed four new prototypes, piloting better quality yarns. Information cards explaining the provenance of each yarn, and the recycling process were produced to help promote the environmental benefits of each new product to customers.

An important outcome of the project has been the establishment of a specialist consultancy service as part of iinouiiio’s business, providing advice to brands on how they can achieve circular approaches from their valuable waste and resource streams. This has attracted significant interest generating new commercial deals and encouraging high value brands

such as the Alex Begg Group to incorporate more recycled fibres into their yarns.

Key Outcomes and Impact

- Launch of new yarns, high quality and value woven materials.
- iinouiiio made a partner of Camira Group, one of the UK’s largest designer, manufacturer and supplier of commercial textiles for offices, education, healthcare, transport and medical contexts.
- This partnership has opened up new and timely UK collaborations including with John Smedley, one of the most iconic knitwear brands in England.
- Amplification of the environmental impact of innovative wool resource, recycling and processing methods.
- TRL increase: from 3 – 9 (increase by 6 TRL).
- MRL increase: from 2 – 5.5 (increase by 3.5 TRL).



Feed stock, made up of post-consumer wool garments, ready for shredding and spinning into new yarns.



Samples of high quality fabrics made from post-consumer recycled wool yarn.



### 5.4.5 Project Plan B

#### Applying circular design principles in the repurposing of polyester waste back into usable monofilament yarn

Project Plan B is a garment design and manufacturing company specialising in workwear and school uniforms predominantly using polyester materials. They manage the entire production process from design, sampling, yarn and fabric purchase through to garment manufacture and client delivery. Customers include work wear catalogue companies and those providing uniforms to large scale employers (typically over 5,000 employees) such as supermarkets and healthcare businesses.

The company has a strong commitment to tackling global environmental challenges faced by the textile industry and believe that by redesigning the way things are done, right from the beginning, can reduce the impact on the environment. Project Plan B have developed a range of circular clothing principles that enable commonly used garments to be made from recycled and recyclable materials. Through their unique recycling technology they can turn these garments back to rPET (recycled polyester) yarn, the raw material for all polyester garments.

Prior to the start of the project the business had already conducted trials on some key fabrics using their unique recycling system, but had significant gaps in knowledge, especially when recycling different polyester fabric types. To bring the full range of garments and textiles into a circular system they needed to prove that the main polyester fabric types commonly available could be recycled and reprocessed into yarn. Data on the carbon saving that could be generated also needed to be calculated and monetised to enable the commercial viability of the process to be demonstrated.

**The BFTT R&D project required expertise in circular design and textile process engineering. The project set out to undertake research on different types of polyester waste, assess their suitability for recycling back to usable yarns, to produce woven polyester materials, and calculate the environmental impacts, particularly the carbon footprint of the recycling process.**

The project collected 19.8 tonnes of textile polyester post-consumer waste, which enabled five trials to be conducted. The shredding and pelletising of the waste was undertaken at their business partner's laboratory in Austria (due to specialist machinery not being available at the time in the UK). The waste collected yielded over 6 tonnes of rPET of fibre-grade yarn that could be spun into quality filament yarns at a commercial spinning plant in Spain. Using injection moulding, the lesser quality rPET was used to produce other notions such as buttons.

A Life Cycle Analysis (LCA) and carbon footprint analysis for producing rPET pellets from different types of textile polyester was completed. This allowed the project to capture the environmental impact of recycling. The LCA of the three fabrics tested showed that circular polyester textiles had a significantly lower environmental impact than virgin polyester.

The project proved that the entire process is technically viable and financially beneficial. Project Plan B aimed to establish a UK-based circular clothing recycling unit, which has now been realised. The trials conducted by the project have provided the necessary data to help turn an idea into a commercial reality and provided them and their partners with the necessary confidence to purchase the first polyester recycling machine for the UK.

As Tim Cross, CEO of Project Plan B explained, **“At the start of the project, we could describe the need, but we did not have evidence to prove the saving. We now also have solid numbers from the carbon footprint study with which we can go to our stakeholders.”**

#### Key Outcomes and Impact

- 19.8 tonnes of textile polyester post-consumer waste enabled five trials, shredding and pelletising of the waste undertaken at a specialist business partner's lab in Austria.
- 6 tonnes of rPET / fibre grade yarn spun into quality filament yarns at a commercial spinning plant in Spain.
- Lower quality rPET was used to produce good quality buttons for clothing, using injection moulding.
- A Life Cycle Analysis (LCA)/carbon footprint analysis for producing rPET pellets from different types of textile polyester was completed.
- A significant circular polyester proof of concept developed at scale.
- Creation of a new polyester textile circular re-cycling facility.
- 20-30 new potential clients ready to send waste when machine up and running.
- New markets identified for recycling of post-industrial textile waste.
- TRL increase: from 4 – 7.5 (increase by 3.5 TRL).
- MRL increase: from 1 – 4.5 (increase by 3.5 TRL).



Pelletised R-PET made from post-consumer polyester waste.



Polyester feedstock, including offcuts from products such as football shirts, ready for shredding and processing into recycled R-PET pellets.



### 5.4.6 SEGURA

#### Developing an online sustainable supplier marketplace

Segura is a tech company that specializes in supply chain management solutions. They provide tools for retailers to map, monitor and report on their supply chains, from ordering, working with suppliers, and meeting business, ESG and relevant legal standards. The tool helps retailers ensure that their chosen suppliers for all products – including for fabrics, trims, fastenings and all other components – are adhered to within their supply chain and that no unauthorised third-party suppliers are involved at any stage of production. In turn, retailers are able to be confident and transparent about their supply chains with their customers.

Through BFTT, Segura sought to develop a new solution – a Sustainable Supplier Marketplace (SSM) - an online platform that would make it simpler and more efficient for clothing retailers to work with ethical and sustainable textile and apparel producers and manufacturers across the globe. This new tool would not only offer an efficient vetting system for brands to identify appropriate suppliers but would also place sustainability at the forefront of the textiles and apparel industry's global supply chains.

BFTT enabled Segura to develop an initial framework for the Sustainable Supplier Marketplace. The R&D involved extensive research, via interviews, surveys and focus groups with suppliers and retailers – from small brands to large scale department stores and supermarket clothing retailers with complex global supply chains. Through this data collection an in-depth understanding of the issues faced by retailers was achieved, surrounding onboarding of suppliers, sustainability and employment standards.

As a result, the scope of the Sustainable Supplier Marketplace expanded to be a solution for both retailers and suppliers. A standardized and detailed profile covering production capabilities and capacity, alongside sustainability certifications, would be completed by a supplier. This could then be used by a retailer to shortlist and select appropriate suppliers according to the retailer's specific requirements.

**“We have had very positive feedback from retailers interested in how the SSM will support suppliers in raising their standards, significantly reduce the amount of time spent on responding to individual information requests, which not only benefits the industry, but people and the environment, too.”** explains Peter Needle, Founder and President of Segura.

The R&D also had unexpected positive outcomes. During the data collection and reviewing of literature, the team reviewed all current compliance schemes and regulations relating to textile and apparel production. This provided invaluable insight into the importance of having an advanced compliance automation tool, and how attractive this would be to potential clients.

#### Key Outcomes and Impact

- Foundations for a New Product: In depth baseline research, customer analysis, UX, competitor analysis and functionality requirements for the SSM Platform.
- TRL increase: from 1-2 (increase by 1 TRL).
- MRL increase from 0-3 (increase by 3 MRL).
- Building the Business Case: Delivery of the Business Requirement's specification based on the baseline research to enable Segura to move to the technical build phase of the work. This Business Requirement forms a major part of Segura's business case for further investment.
- Increasing Client Reach: Onboarding three new large-scale clients for existing service offering, with whom the new Segura Sustainable Marketplace platform could be trialled.
- Segura have achieved further global VC investment (confidential).
- Significant business growth – Segura have achieved between 80-111% growth year-on-year every year from 2020.
- Approximately £1.5m additional revenue directly related to the R&D project.
- “...the growth since the project has allowed us to grow and develop using our own resources. We are now profitable and sustainable” - Peter Needle, Founder and President, Segura.

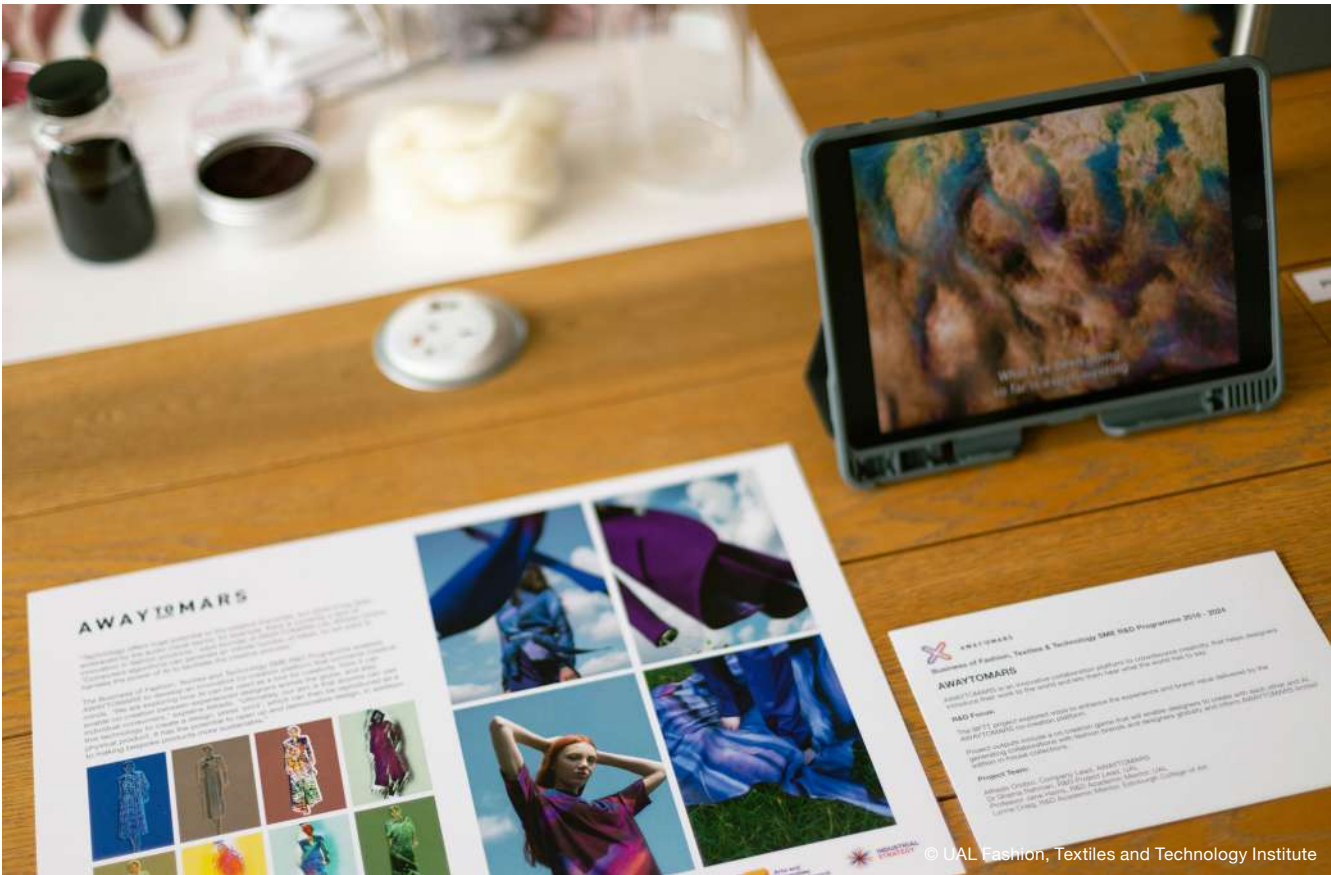


Segura supply chain transparency platform.

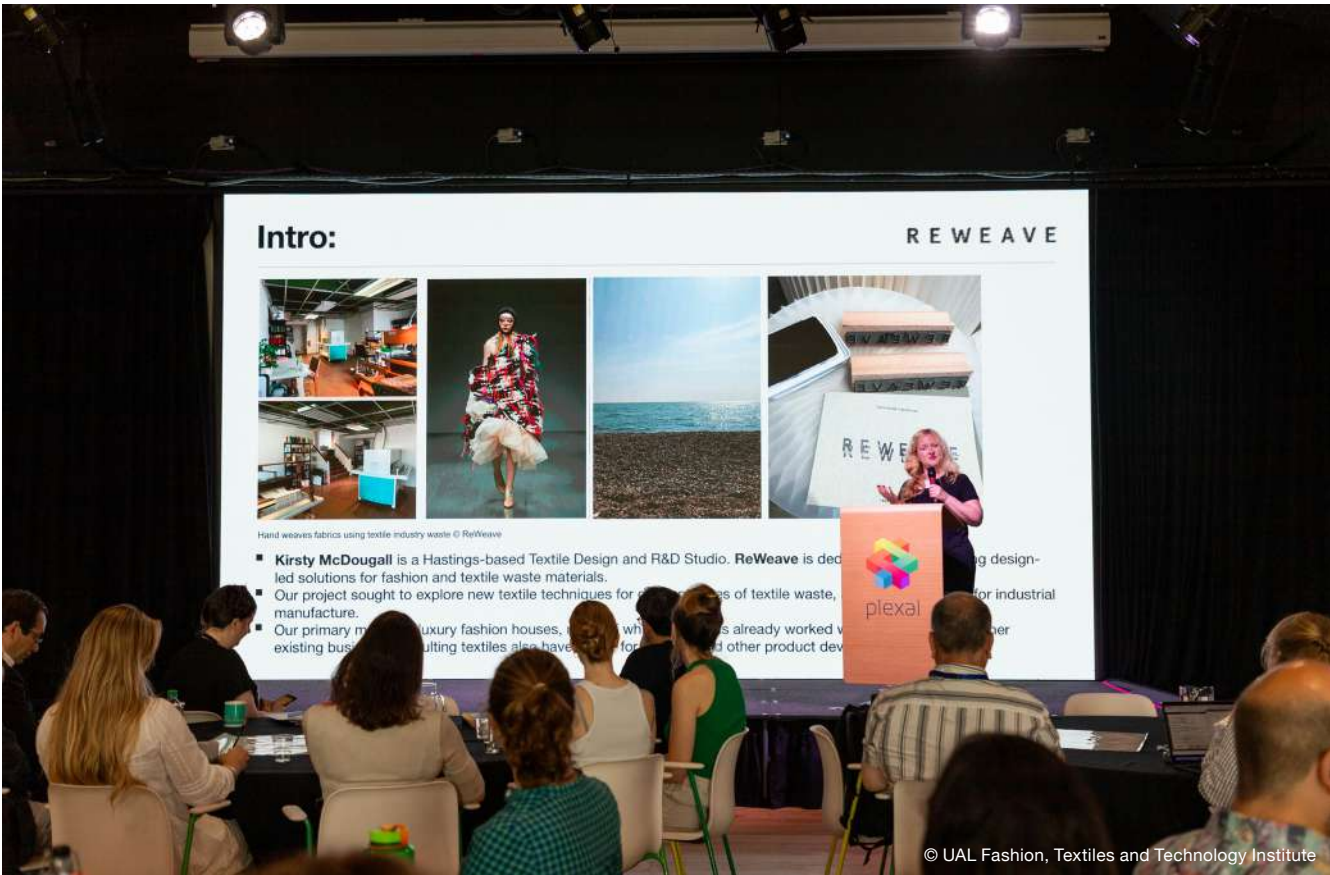




Dr John Parkinson, co-founder and managing director of iinouii presenting at BFTT Plexal event, 2023.



R&D showcase of AWAYTOMARS AI-powered design project at BFTT Plexal event, 2023.



Kirsty McDougall, textile designer and founder of ReWeave, presenting at BFTT Plexal event, 2023.



A guest interacts with the Cloudwool sneaker at BFTT Plexal event, a collaboration between Doppelhaus and Grenson, resulting from an R&D partnership.





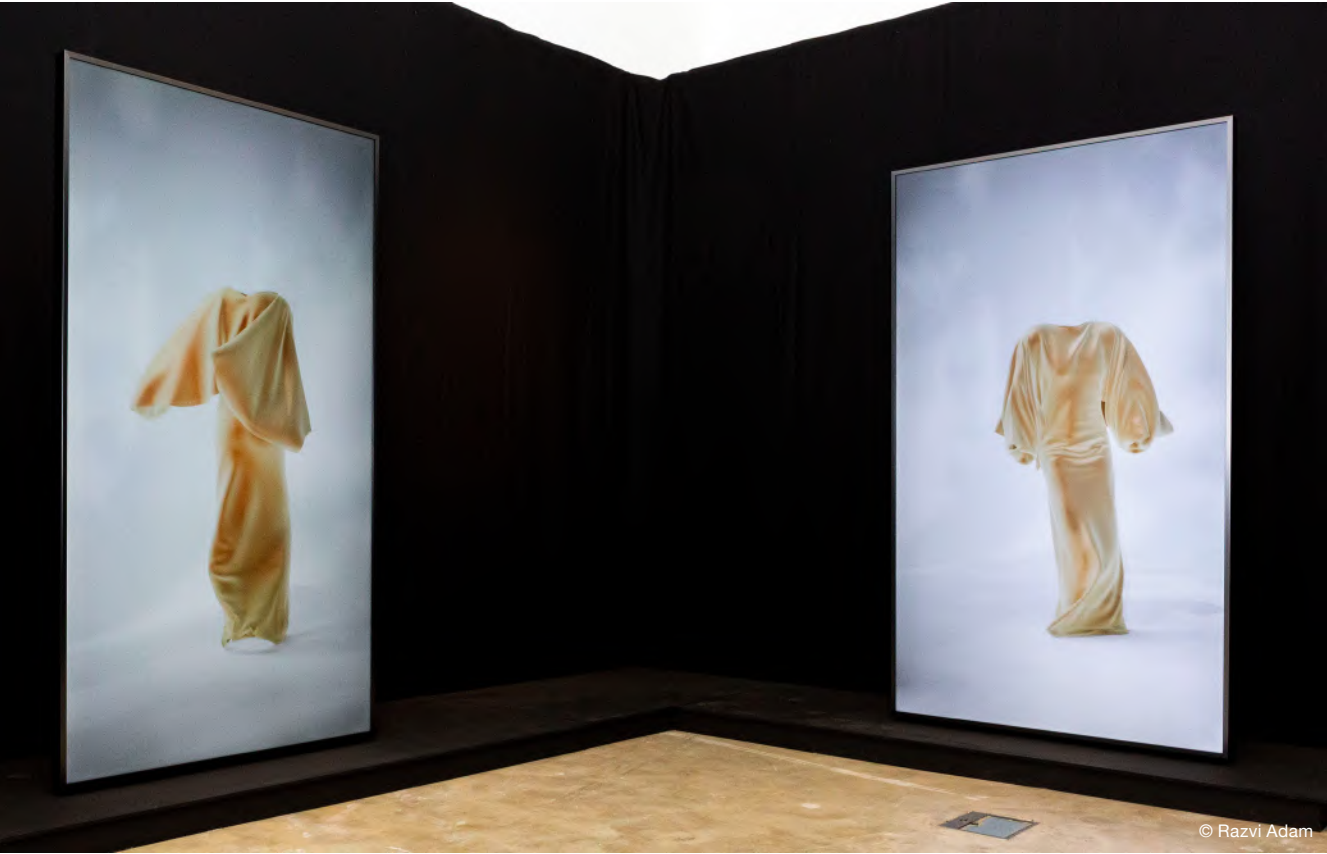
From left to right, Dr Liz Tregenza - Lecturer in Cultural & Historical Studies at London College of Fashion, Maria Grachvogel - Maria Grachvogel, Mike King - Numerion Software, Alex Lambert - Happy Finish, at the BFTT Made in Code event, V&A, 2023.



Guests at the BFTT Made in Code event, V&A, 2023.



Panelists at the Made in Code event, V&A, 2023.



Virtual garments based on designs by Maria Grachvogel, BFTT Made in Code event, V&A, 2023.



# 6 Future Fashion Factory



Guests at the Future Fashion Factory Year 1 Showcase. © Future Fashion Factory

### 6.1 FFF Methodology

The Future Fashion Factory (FFF) programme designed a responsive R&D mechanism following a series of industry consultations, both formal and informal, with cluster companies and the wider F&T sector. This included UK sector bodies, UK Fashion & Textile Association (UKFT)<sup>14</sup> and the British Fashion Council (BFC)<sup>15</sup>, as well as local government bodies, Leeds City Council and Leeds City Region LEP and regional sector bodies, Yorkshire Textiles<sup>17</sup> and the Huddersfield Textile Centre of Excellence<sup>18</sup> (TCoE). Existing F&T industry partner organisations in the Yorkshire region, AW Hainsworth & Sons Ltd, Abraham Moon & Sons Ltd, Burberry PLC, WT Johnson & Sons Ltd were also consulted to understand perceived challenges and unmet innovation needs.

These early consultations identified the need for a mechanism with flexibility and responsiveness to industry requirements, both to address a degree of cynicism regarding historical deployment of UK R&D funding for the benefit of industry, and to build trust through more empathetic handling of the development and contracting process. Some business leaders felt that previous UK R&D funding schemes were too complicated, time consuming and costly to prepare, and calls were not aligned with F&T sector priorities. The prospect of a new streamlined mechanism via the CICIP programme was therefore welcomed by industry, if it could:

1. Connect businesses (particularly SMEs) with appropriate University academic expertise, as well as other firms within the cluster, or wider supply chain networks.
2. Focus on R&D proposals addressing specific innovation gaps defined by industry that could harness academic expertise to assist in their delivery. This was distinct from projects focusing on academic research ‘looking for a home’ in industry.
3. Enable co-developed, co-delivered and co-financed projects between industry and HEIs.

### 6.2 FFF Responsive R&D programme design

The CICIP ‘Commissioned R&D’ funds in the FFF programme were referred to as ‘Responsive R&D’ funds. This change in nomenclature reflected significant industry consultation prior to launching the first call for proposals in January 2019, and was intended to signal that industry’s voice had been heard in terms of the need for an agile mechanism.

Reference to ‘Responsive R&D’ also reflected FFF’s core value of encouraging industry-led innovation, which over time must respond to changes in the business landscape and market dynamics as well as regulation. Six calls for proposals were made over the course of the FFF programme, enabling project ideas to be supported that responded to changes in

<sup>14</sup> UKFT. (2024a). About UKFT. Retrieved from <https://www.ukft.org/about/>  
<sup>15</sup> BFC. (2024). British Fashion Council - About. Retrieved from <https://www.britishfashioncouncil.co.uk/About>  
<sup>17</sup> Yorkshire Textiles (2025). Retrieved from <https://yorkshire-textiles.co.uk/history/>  
<sup>18</sup> Huddersfield Textile Centre of Excellence (2025). Retrieved from <https://tcoe.co.uk/>



market conditions, and business opportunities from year-to-year. Proposals were considered by an independent Investment Committee (IC) against clearly defined funding criteria, set out in the call guidance documents. The IC included senior industry representatives, including the CEO of UKFT, technical academic expertise, university commercialisation managers and regional textile manufacturing & skills input (TCoE). Contracting and financial due diligence was carried out separately by professional staff within the University of Leeds who were not involved with FFF programme delivery. Overarching support and oversight were provided by an external Steering Group involving company directors from across the cluster, senior University management, as well as Research Council representation. A separate Programme Management Group was responsible for progressing the core research and ensuring responsive mode R&D progressed in accordance with overall programme objectives.

Calls were structured to provide industry applicants with as much flexibility as possible, leaving the decision on the balance of industry and academic inputs, and the associated costs in their hands, depending on the specific needs of the project. Alignment with the collaboratively developed FFF Core Research Themes (CRTs) was a key component within the gateway criteria for funding, helping to retain the structure and integrity of programme design. All projects required a degree of industry match-funding. Three levels of R&D support were provided, Proof of Market (PoM), Proof of Concept (PoC) and Innovation Challenge Projects (ICP) (**Table 2**), all of which were designed to encourage relatively short, tightly focused projects, with clearly defined objectives, consistent with business needs. **Table 3** gives an overview of the six calls for proposals across the FFF delivery period, showing the split of project types.

| Funding Stream                     | Total Project Value | Maximum Grant Value | Purpose                                                                                                                                                                               | Funding Breakdown                                                                                                             |
|------------------------------------|---------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Proof of Market (PoM)              | Up to £10k          | £9k                 | To evaluate a market opportunity; identify existing IP/conduct freedom to operate searches; explore further funding options; carry out small-scale R&D activity.                      | 10% minimum match-funding requirement<br>90% Intervention rate                                                                |
| Proof of Concept (PoC)             | Up to £50k          | £37.5k              | To carry out interventions that progress proven methods and knowledge into validated technologies for a defined application.                                                          | 25% minimum match-funding requirement<br>Up to 75% Intervention rate<br><i>Varies depending on company size &amp; project</i> |
| Innovation Challenge Project (ICP) | Up to £100k         | £60k                | Funding for innovations in partnership with industry to demonstrate and begin to scale up new technologies in a commercial setting. Such projects should be near to market (TRL 7-8). | 40% minimum match-funding requirement<br>Up to 60% Intervention rate<br><i>Varies depending on company size &amp; project</i> |

Table 2: Overview of FFF Responsive R&D structure showing the three levels of funding available (FFF, 2019) p.2)

|        | Launch Date    | Call Type                   | Projects Awarded | Project Types       |
|--------|----------------|-----------------------------|------------------|---------------------|
| Call 1 | January 2019   | Single Stage                | 9                | 2 ICP, 5 PoC, 2 PoM |
| Call 2 | September 2019 | Single Stage                | 10               | 4 ICP, 4 PoC, 2 PoM |
| Call 3 | April 2020     | Two Stage                   | 13               | 2 ICP, 7 PoC, 4 PoM |
| Call 4 | April 2021     | Two Stage                   | 12               | 4 ICP, 7 PoC, 1 PoM |
| Call 5 | July 2021      | Two Stage                   | 5                | 3 ICP, 2 PoC        |
| Call 6 | January 2022   | One Stage, single CRT focus | 6                | 6 PoC               |

Table 3: FFF Calls for Proposals – launch dates, number and distribution of awards and call types.

Over the delivery period, the FFF Responsive R&D programme:

- Attracted 300 validated applications across the six calls.
- Made awards to start-ups, micros and SMEs, as well as larger companies collaborating with SMEs.
- Stimulated a further 164 collaborative funding applications to other competitions resulting from the R&D ecosystem fostered by the FFF network.
- Enabled 12 new commercial licences / co-development opportunities from FFF’s collaborative R&D work, leading to significant external investment (including Series A and B venture capital) as well as follow-on funding secured by start-up companies.

The value of FFF’s Responsive R&D funding structure was described by a F&T business leader on FFF’s industry Steering Group, and now Chair of LITAC’s Advisory Board, as follows:

*Central to success has been the programme’s brokerage activity which has matched individual company requirements with the skills of the research faculty, delivering activity within timescales relevant to businesses without excessive bureaucracy. We now have a model that works.*  
– **Paul Johnson, MD of WT Johnson & Sons Ltd**



### 6.3 FFF Responsive R&D Mechanism

#### Application

While the basic structure of the Responsive R&D mechanism remained unchanged in terms of objectives, levels of funding, governance and robust decision-making, FFF iteratively refined each call for proposals in response to industry feedback, as programme delivery progressed. Industry partners were clear from the start that business impact should be embedded as part of programme development.

Initial industry consultation identified the need for a streamlined funding mechanism, and highlighted the need for brokerage, involving experts with F&T sector-specific experience, already working within the creative cluster. Consequently, FFF employed a F&T sector specialist who was already well-respected within FFF's creative cluster, and who was also familiar with UK industry funding schemes. The sector specialist was able to help guide the development of company project ideas, connect with appropriate academic teams, and support the framing of R&D applications, but was not involved in the decision-making of the Investment Committee.

Calls 1 & 2 piloted a single stage approach. Following the delivery of Call 2, which was heavily oversubscribed, feedback on the mechanism was sought from FFF's Steering Group and Programme Management Group, as well as from both successful and unsuccessful applicants. Whilst feedback on the brokerage support and simplified mechanism were positive, some SMEs felt that further streamlining would be helpful. This was addressed by creating a two-stage process, involving an initial Expression of Interest (EOI), followed by Full Applications invited only for the strongest proposals. The two-stage approach was adopted for Calls 3 to 5. For Call 6, FFF reverted to a single stage process because the call was focused on a specific core research theme (CRT) challenge, such that fewer applications were expected overall.

Across all six funding Calls, the requirements of the Responsive R&D programme were made transparent by detailed call guidance documentation issued to applicants, which also provided information on timelines and the decision-making process to be followed by the Investment Committee. The iterative feedback process was discussed and agreed by the FFF Steering Group and Programme Management Group, attended by AHRC, and financial delivery was overseen by the University of Leeds' Faculty Research & Innovation Office (FRIO), which undertook independent due diligence on all funded projects.

#### Embedding Skills

From the very early stages of industry consultation in FFF's creative cluster, skills development across the industry, including apprenticeship training and degree programmes, was identified as a major unmet need, such that Skills and Education became one of FFF's five core research themes (CRTs). It was expected that Responsive R&D applications should align with one or more of the CRTs defined by the Cluster, and that a mechanism

to embed skills within all the responsive R&D projects should be clearly presented. This proved to be an important decision, with knowledge exchange and skill sharing leading to both expected, and unexpected, project outcomes.

Central to the design of each Responsive R&D project was the expectation that academics involved in project delivery would co-create and deliver proposals with industry partner/s, to understand their business operations, build robust understanding of unmet needs and practical knowledge of real-world boundary conditions that might hinder R&D implementation. By co-creating innovation in this way, harnessing both industry and academic expertise, long-lasting research relationships have been forged, strengthening the capacity for innovation within the cluster even further. Both senior academics and early career researchers (ECRs) were part of most FFF project teams, and this has been instrumental in upskilling researchers, providing them with detailed new insights into wider industry challenges and opportunities.

The experience of academics involved in the delivery of FFF Responsive R&D projects with industry, as well as the resulting case studies and follow-on activities, have also greatly enriched the syllabus of both under-graduate (BA, BSc) and post-graduate (MA, MSc) teaching programmes at Leeds as well as the other collaborating HEIs.

FFF was careful to build flexibility into all projects, e.g. academic vs. industry inputs and costs, to ensure resource allocations were appropriate for effective delivery of the stated aims. Some projects were technically driven, requiring much of the resource to be focused on accessing specialist researcher time, whereas in other projects academic input was confined to providing a high-level guidance and validation of new, creative concepts. This approach worked well, allowing projects to be customised in a way that maximised impact.



## 6.4 FFF R&D Case Studies

Over 50 responsive R&D projects were supported in the FFF programme. This section highlights a few involving creative developments in F&T design, manufacturing and the harnessing of digital technologies.

### 6.4.1 ABRAHAM MOON

#### Digital Development for Consistent Colour Control

With 30 years in the textile industry Abraham Moon's Dyehouse Manager has developed a broad and deep knowledge of the dyeing process. At the Moon mill in Guiseley, West Yorkshire – the town where the company has been based since it was founded in 1837 – his team ensures consistency in the colour of each luxury Moon fabric and accessory. Moon customers include international luxury brands Burberry, Paul Smith and Ralph Lauren.

The dyeing process typically starts with the blend number (e.g. 106d) and works backwards, breaking it down into the specific dye colours needed to achieve the right effect. It is a complex and creative process, done almost entirely by eye in a lightbox – and as wool can vary from year to year and even from sheep to sheep, expert staff draw on their skills and experience to make the subtle adjustments required to maintain a consistent shade.

For quality control and audit the mill uses a spectrophotometer, a specialist colour measurement tool that allows for accurate matching and enables the team to keep a record of readings for future reference. Ultimately the process relies on the unique expertise of experienced dyers.

*“A lot of this process is trial, and error and our experience allows a good level of accuracy... At Moon, we started considering how we could make the colour-matching process more efficient with digital technology.”*  
– Dyehouse Manager, Abraham Moon

Collaborating with Professor Stephen Westland and research assistant Keith Findlater at the University of Leeds, the project had two distinct parts: to analyse the colour measurement process and understand the available data; and to explore how this data could feed into a predictive model determining the colour requirements for blended fibres. As Professor of Colour Science and Technology, Stephen has worked with numerous industry partners and published around 200 papers, book chapters and books on colour science, design and imaging. With his expertise in machine learning and analysis, he also leads Future Fashion Factory's Core Research Theme on Data-Driven Design.

The first phase saw Stephen and Keith meeting with the production team at Moon to examine how samples are prepared and presented, while Keith also took standard blends and pads from the mill for further analysis. They looked at how existing technology could enhance the process, for example, whether VeriVide's DigiEye tool could scan a sample and immediately identify the necessary adjustments.

*“That was when we realised that the issue wasn't with prediction – it had been in measurement all along,” “Samples are prepared slightly differently by each person, so we need to standardise the whole process and guarantee more consistent data for our existing colour measurement tools. We invested in a new padding machine to solve this problem, so the pad will be the same even when different teams are working.”* – Dyehouse Manager, Abraham Moon.

The padding machine, a capital investment of just over £31,000, was made by the company as a direct result of the original project and was rapidly used for its first few jobs. By decreasing the waste produced in manufacturing and minimising product sold at a discount due to quality issues, improved colour consistency will protect Moon's margins and reduce its environmental impact.

In addition, the company has started investigating new equipment such as a specialist carding lab for quality testing and sampling, which would allow for further gains in productivity and efficiency and relieve the pressure on production staff to manage the process by eye.

*“This new approach doesn't negate our knowledge, creativity and skill, but it does make our jobs much easier,”* the Dyehouse Manager added. *“We've been doing this for years, but we can't keep doing the same thing forever. Without this project we absolutely never would have looked at the issue from this perspective. I would absolutely do it again.”*

#### Key Outcomes and Impact

- Reduction in costs through reduced manufacturing waste and a decrease in returns
- Higher quality, colour consistent products.
- Increased operating margins.
- Capital investment during project delivery: new padding machine (£31,000).
- Unanticipated spillover benefits into how the manufacturing process was designed.
- Updated testing and sampling processes.



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© Abraham Moon &amp; Sons



## 6.4.2 AMPHICO

### Recyclable Alternatives to Waterproof Breathable Textiles

Waterproof breathable textiles (WBTs) are ubiquitous in the outdoor apparel sector. They offer high levels of performance so consumers can spend hours facing the elements, but they are also very difficult to recycle and use chemicals with negative environmental impacts. Working with Future Fashion Factory researchers, Amphico (formerly Amphibio) is developing a fully recyclable, sustainable alternative to existing WBTs.

Customers look for WBTs to keep them dry and comfortable whatever the weather. To do this the materials usually consist of at least a woven layer bonded together with a membrane, so that the fabric repels the water whilst the membrane lets sweat pass through. The challenge is that the layers are usually made from different materials. To recycle a garment using one of these WBTs means having to separate each layer – a time-consuming, resource-intensive process which often makes it very costly to turn used outerwear into new products.

When recycling is prohibitively expensive or technically impossible, used WBTs contribute to the huge quantities of waste textiles sent to landfill or incineration every year. Given that existing products are usually made with chemicals such as poly-fluorinated chemicals (PFCs) which release harmful chemicals into the air when incinerated, this leads to significant impacts on the environment.

Amphico was founded by RCA graduate Jun Kamei to solve this challenge by developing a WBT where both layers were made of the same novel material, offering a fully recyclable alternative to existing options. To take the start-up's original fibre and turn it into a viable product, Amphico collaborated with Professor Stephen Russell, Dr. Mark Taylor and Dr. Ioana Taylor at the University of Leeds.

*“My background is in materials and in water-repellency, but we really needed that input on the fibre and woven side. This project gave us access to the knowledge, technical capabilities and support from the experts to fill that gap.”* – Amphico Founder, Jun Kamei.

The researchers worked with Amphico to refine the fibre and explore ways of optimising the manufacturing process to improve its performance, ensuring the new product could match the same high-quality standards as existing materials. This in turn laid the groundwork for a new prototype of the company's three-layer WBT, Amphitex™.

Brands can now use the prototype to test and trial Amphitex™ for their own collections, but Amphico has also started to demonstrate how the material can be used in a range of outerwear pieces. Leeds-based manufacturer Reshore Apparel consulted with the team on the construction of prototype garments.

*“Seeing how the Amphitex thread moves through the material showed us where we can refine the product. We can measure individual components to make sure we're a market leader in performance as well as sustainability.”*

– Amphico Founder, Jun Kamei.

With Amphico on the verge of bringing a new recyclable WBT to market, the project partners are still collaborating. For now, the priorities are on upscaling production to meet demand from large brands, as well as trialling end-of-life technologies to identify how recycled Amphitex™ can be used in new products.

*“We're now ready to be interesting to brands and get some initial trials going,”* Jun adds.

*“It's amazing that in a year we've gone from that fibre to something that actually looks like sportswear!”*

– Amphico Founder, Jun Kamei

### Key Outcomes and Impact

- Design and development of a new coating and PFAS/PFC-free alternative to traditional breathable waterproof textiles.
- Mono-material product which removes barriers to end-of-life processing/recycling.
- Reduced greenhouse gas emissions during manufacturing.
- Significant movement for the sector towards a closed-loop business model.
- New products: trademarked yarn Amphidry™ and fabric Amphitex™.
- Leveraged IUK SMART award of >£1.17 million for follow-on innovation with the University of Leeds.
- 3 pending patents protecting the design of the new fibre, membrane and materials.
- Leveraged US\$1.59 million seed round investment (2023).
- Terra Carta Design Lab winner (2022).
- Winner of the Alibaba.com prize at ISPO Brandnew (2022).



### 6.4.3 HYLO ATHLETICS

#### High Performance Running Shoes that Keep Pace with Sustainability

Michael Doughty, Co-Founder of Hylo Athletics Ltd, had always known that the sportswear industry was broken. A former Premier League professional footballer and now-runner, Michael had a keener insight than most when it came to the taboo subject of sustainability in sports. Encouraged to keep controversy to a minimum, the impact of sports and sportswear on the environment is generally kept quiet across the sporting industry.

However, this silence had become only more deafening in recent years due to the sporting and sportswear industries' increasing reliance on polyester. Despite being the world's most consumed textile fibre, recycled polyester only contributes to 15% of total production. To not fall short of the UN's Sustainable Development Goal of recycling 90% of PET plastic by 2030<sup>19</sup>, recycling of textile fibres such as polyester must be stepped up dramatically. As part of this aim processes which facilitate fibre-to-fibre recycling of polylactide will play an essential part. Hylo's collaboration with FFF contributes to filling this crucial capability gap.

Hylo Athletics was formed as a direct response to Michael's dual passions for the sports and the environment. The brand was established in 2020 to protect the future of running and sport and uses materials science to create products that deliver high performance for athletes and low impact for the planet<sup>20</sup>. Through their collaboration with Professor Richard Blackburn at the University of Leeds, they trialled new end-of-life recycling processes for performance, supporting their development of a circular manufacturing model where used footwear can be recycled back into new products. This innovation improved the circularity of Hylo's production process by enabling more efficient recycling of polylactide fibres, an important component in athletic footwear.

Professor Blackburn commented, *"it is great working with a Hylo because they are a company who understand sustainability and the importance of understanding the environmental impact of consumer products through their full life cycle. The collaborative research we're working on is moving Hylo products towards increasing circularity and is adopting a detailed scientific approach to recycling the materials using innovation. It is great to be working on a project that is uncovering both new science and has the potential for impact at the product level."*

The development of this innovative new process is promising not only for Hylo but hopefully for the entire athletic footwear industry. Future Fashion Factory, along with Hylo, looks forward to seeing the impact that an improved polylactide fibres recycling process has across the sporting industry, thus tracking tangible changes towards the direction of sustainability.

<sup>19</sup> United-Nations. (2023). Sustainable Development Goals. Retrieved from <https://sdgs.un.org/goals>  
<sup>20</sup> Hylo Athletics. (2024). Hylo Athletics, About Us. Retrieved from <https://hyloathletics.com/pages/about>

Michael Doughty, Hylo Athletics Co-Founder and Managing Director said *"we are very grateful to have the support of the FFF in our pursuit to ensure that Hylo takes accountability for its products from beginning to end."*

#### Key Outcomes and Impact

- Sustainable materials alternative to traditional sports footwear manufacture.
- Development towards a closed-loop business model.
- Leveraged £2.5 million in Series A investment (2022).
- Positioned the company as an ambassador for sustainable development in sportswear.
- A winner in the SME Elite Business Awards (2024) for innovative businesses.
- Launched the Hylo Local Champions Fund, small scale funding to promote access to movement, human connectivity and protect the planet.



Hylo Athletics running shoe

© Hylo Athletics

#### 6.4.4 JOSHUA ELLIS

##### Consumer Research Influencing a more Sustainable Future

In over 250 years, Joshua Ellis & Co. Ltd has been owned by just three families. At the heart of Yorkshire's textile industry since it opened in 1767, the company specialises in luxury cashmere fabric and accessories which are exported around the world. While proud of its heritage the business is also investing in its future, developing partnerships with some of the world's biggest brands – Alexander McQueen brought Kate Moss to the mill in Batley to shoot their Autumn/Winter 2019 campaign – and building new initiatives to ensure the business is sustainable for the next 250 years.

*“We began to discuss the idea that by recycling cashmere from other products when they reached the end of their lives, we could potentially open ourselves up to new more price-conscious markets and customers without compromising our commitment to quality and sustainability,”*  
– former Managing Director, Joshua Ellis.

The company needed to understand whether there was a market for accessories that used recycled cashmere, and how much of the product should be recycled. Previous tests had suggested that the finish on the product changed with more than 25% recycled fibre in the mix. For Joshua Ellis, this suggested the choice was to produce either a 100% recycled cashmere product, or an item made largely with virgin fibre and a small proportion of recycled material.

While the FFF team worked with the company to develop their full application, we also identified researchers whose interests aligned with the project and introduced Joshua Ellis to Dr. Alice Dallabona at the University of Leeds. Alice researches the luxury fashion industry, as well as fashion marketing and the relationship between fashion and identity. She collaborated with the team at Joshua Ellis to shape the key research questions, speaking to both the company's Managing Director and Sales Director to understand the concerns expressed by the company's customers.

Building on existing research by academics and industry and with the support of research assistant Camilla Bandera, Alice set up focus groups with luxury fashion consumers where they were asked about their interest in sustainability and how it affects their buying decisions. While most respondents said that they were aware of issues around sustainability and environmental impacts, they were more likely to act on these concerns when it came to food or energy consumption than with fashion. Combining existing research with the results of the focus groups, the analysis showed that luxury customers are interested in the sustainability of brands. However, the environmental impacts of a luxury product are not a significant priority: positive environmental messages are often seen as an 'extra' on top of a product the consumer would buy anyway.

Rather than confirming the company's theory, Dr. Dallabona's report gave a new perspective on what sustainability really means for a luxury brand

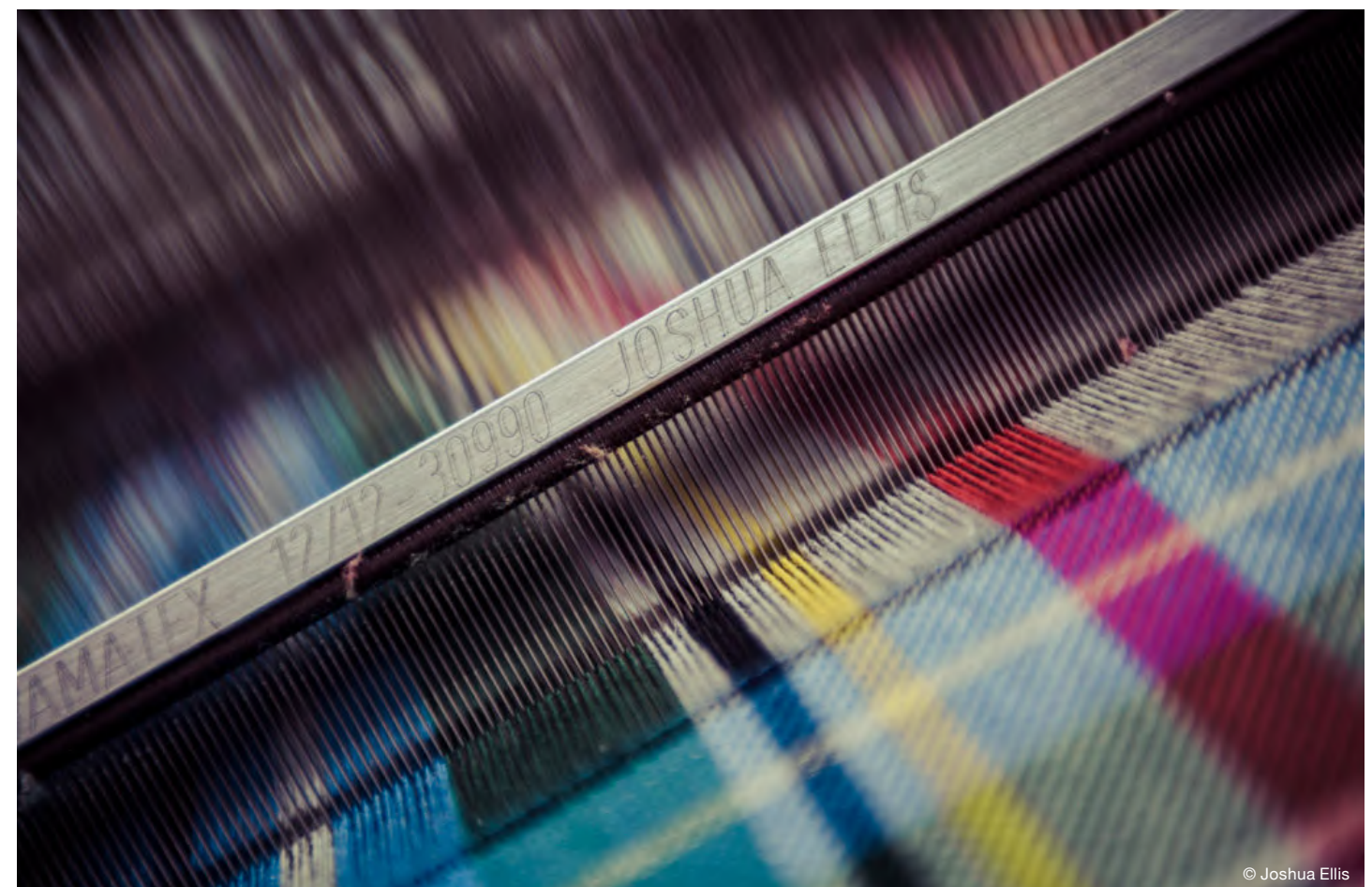
like Joshua Ellis, as well as for the 24 other textile businesses owned by SIL Holdings – a family-owned group based in Bradford. After the report was shared at group level, SIL decided to recruit a Sustainability Director to focus on this question and to champion sustainable practices across all 25 of the group's companies.

In addition to fulfilling the brand's pledge to eliminate single-use plastics, the Joshua Ellis Managing Director said that the company is now thinking more broadly about its supply chain and manufacturing processes, from reducing water usage to supporting high standards of animal husbandry.

*“We want to ensure sustainability is at the heart of everything we do, and this project has made it clear that we need to focus our efforts on a variety of different initiatives throughout our supply chain and manufacturing.”*  
– Managing Director, Joshua Ellis.

##### Key Outcomes and Impact

- Critical new insight into a key business assumption regarding sustainability.
- Unanticipated project outcome influencing wider group policy, unlocking investment for the appointment of a new Sustainability Director for SIL Holdings.
- Development of new sustainability statements for all members of the SIL Holdings.





### 6.4.5 MATERRA

#### A Radical Approach to more Sustainable Cotton Production

Demand for cotton continues to grow across the global fashion industry; new solutions are needed to tackle the negative impacts of cotton production in the face of environmental challenges such as climate change and water scarcity. In a collaborative project funded by Future Fashion Factory, Materra Ltd (formally Hydrocotton Ltd) built the evidence base to refine the company's low-impact cotton farming technologies and continue to develop them on a commercial scale<sup>21</sup>. Materra have established partnerships with fashion brands Mango, ECOALF and LESTRANGE.

Cotton production accounts for a disproportionate volume of the world's insecticide, land, and freshwater usage. As companies have sought more sustainable options, organic cotton has become increasingly popular – while this requires substantially more land and exponentially higher volumes of water, it still creates serious challenges in managing the planet's natural resources.

Materra's vision represents a new approach to cotton farming; offering higher yields to reduce the amount of land required to meet demand, the start-up's techniques also use up to 80% less water and emit up to 30% less carbon, with a fully transparent supply chain built on close relationships with farmers.

Edward Hill, Materra's Chief Science Officer, says that upscaling the company's techniques to maximise their positive impact will require support from across the industry. To be attractive to future brand partners, customers, or investors, Materra's fibres would have to perform as least as well as traditional alternatives to become attractive to brands and manufacturers.

*"We need to give brands a sense of the benefits of our cotton on a commercial scale" "The question is, do we have a proposition for marketing? And how can we shift the needle when it comes to customers' expectations of cotton?"* – Edward Hill, Chief Science Officer, Materra.

The start-up needed to benchmark the properties and performance of their cotton fibres against those grown using traditional methods. To build this evidence base, Materra has collaborated with Professor Muhammad Tausif at the University of Leeds, analysing, and assessing cotton fibres grown at Materra's pilot farm in India and comparing them with samples used in denim by an Indian mill partner.

Traditional fibre characterisation testing was conducted by a commercial lab partner, providing insights into the current performance of Materra cotton against its competitor. In parallel, Professor Tausif's team conducted broader testing that gives the team deeper insight into the fibre's performance in areas like dye adhesion. Making use of the University of Leeds'

dedicated small batch processing equipment, it was possible to make yarns from Materra cotton to start to understand how it would perform in a commercial product. The data, insights and expertise gained at each stage are helping to pave the way for future research and development.

*"The project has expanded the testing that was possible for us... It's given us a massive value add to the business and strengthened our commercial proposition, and the findings will show us the next areas to explore."*  
– Edward Hill, Chief Science Officer, Materra.

Materra is looking to test its fibres at different lengths as a next step; as the applications for the fibre vary with their size, this is a crucial step to understand how their current offering fits into the market. The team hope to continue working together along Materra's journey to ensure quality, sustainability, and a fair price for farmers in meeting the world's demand for cotton.

#### Key Outcomes and Impact

- Consistently high-quality fibre production.
- Mindful practice of regenerative agriculture.
- Lower environmental impact of production.
- Characterisation of new materials to facilitate market launch.
- International recognition from Fashion for Good, Kering, Arvind and PVH.
- Leveraged US\$4.6 million in Series A investment.
- Established as significant activists for regenerative agriculture<sup>22</sup>.
- Sustainability Award Winners, LexisNexis Legal Awards 2024.



Materra's Master Farmers in Gujarat, India, growing climate-resilient cotton



Materra's regenerative cotton

21 Materra. (2024a). Materra: Future Proofing Cotton. Retrieved from <https://www.materra.tech/>

22 Funes, Yessenia, Growing Climate-Resilient Cotton with Materra's Master Farmers in Gujarat, India, Textiles Exchange 2023, retrieved <https://textileexchange.org/climate-resilient-cotton-materra-india/>

### 6.4.6 PONDA

#### Innovation for Planet-Positive Design

The textiles industry is damaging the planet by creating vast amounts of pollution and consuming too many natural resources – 70% of an apparel brand’s total environmental footprint comes from the materials it uses. Additionally, wetlands now generate 5% of all anthropogenic carbon emissions due to drainage for agriculture, using the rich soils for farming cereals and vegetables. These carbon sinks have become carbon emitters, barren of biodiversity and empty of precious resources.

**Ponda Ltd** (formerly SaltyCo) is a biomaterials company that develops novel textiles from truly regenerative fibres. Ponda’s mission is to accelerate both the movement to responsible materials for the textile industry and the regeneration of our most precious ecosystems<sup>23</sup>. To this end, Ponda collaborated with Professor Stephen Russell, Dr. Mark Taylor and Dr. Ioana Taylor at the University of Leeds on a Future Fashion Factory project that characterised and benchmarked the first prototype of their insulation material: a climate-positive plant-based alternative to synthetic materials or goose down.

Mark and Ioana’s experience made them a perfect fit for the research: Ioana’s PhD focused on performance clothing, while Mark has worked extensively with brands to optimise their existing insulation products. Ponda’s product, however, offered an opportunity to work with something completely new.

*“The material is amazing and the concept of using alternative water supplies has so many positives,” “Ponda has the right ambitions, and we can help them understand what is possible with the product.”* – Dr. Mark Taylor, University of Leeds

The researchers were able to work in the campus lab facilities to complete each phase of testing, but pandemic-related travel and social distancing restrictions prevented the Ponda team from visiting in person. That meant regular progress meetings taking place online, while the researchers carefully photographed and documented different testing processes for the team. Each meeting was an opportunity for the founders to understand more about their product and the technical processes behind it, and for the academic team to understand the commercial requirements from clients.

*“This material can’t actually be characterised in the same way as a conventional fibre, so we started by breaking down how to analyse it,” “Then when it came to reporting we made sure it was clear what the results actually meant for non-specialists.”* – Dr. Ioana Taylor, University of Leeds

Since the completion of the project, Ponda has gone on to achieve great success, launching their first product, BioPuff®, an insulation designed to keep customers warm whilst regenerating damaged wetlands. This

next-generation insulation, which reduces reliance on feather and synthetic fillers, is created by extracting fibres from plants that are grown on regenerated wetlands. Today, Ponda partners with farmers and conservation groups to regenerate wetlands by cultivating *Typha Latifolia*, a native, shallow-water, rhizomatous perennial plant. Thriving in freshwater or slightly brackish marshes, *Typha* proves to be an ideal, low-maintenance crop for wetland restoration.

Working with researchers has given the Ponda founders access to specialised expertise and facilities, but the support and enthusiasm of the academic team has also helped renew their confidence in their goals.

*“Others had been hesitant, but the Future Fashion Factory team was excited about the product from day one,” “They’ve been in the industry so long and really know what they’re talking about. Their seal of approval gave us so much confidence to keep going.”* – Antonia Jara Contreras, Chief Product Officer



Ponda’s BioPuff®

© Ponda

<sup>23</sup> Ponda. (2024, 2023). *Planet regenerating fibres*. Retrieved from <https://www.ponda.bio/#about-us>.



Antonia Jara, Chief Creative Officer said, “As recipients of the Future Fashion Factory Proof of Market grant, our focus remained steadfast on exploring the potential of Typha Latifolia within the textile industry. Our projects encompassed diverse facets, including product innovation, novel harvesting methods, and the development of farming and economic models. While the grant has concluded, we continue to leverage the connections established during that time, particularly with the University of Leeds, which provided expertise, financial support, and executional prowess. Together, we achieved significant milestones, such as the creation of the first characterisation and performance profile of the fibre. These collaborations have not only professionalised our vision but also catalysed meaningful discussions, shaping the trajectory of our practice.”

#### Key Outcomes and Impact

- Early-stage support for the start-up company, materials characterisation work was crucial for building further innovation activities.
- Leveraged >£300k in IUK funding to continue development work with the University of Leeds.
- Leveraged >£700k in market investment.
- Launch of new product range BioPuff®: reduction in carbon emissions, creation of sanctuaries for biodiverse ecosystems & building climate resilience.
- Established bio-materials advocates, paludiculture (wet-land) focused sustainable fibre production.
- Winners of the PETA Fashion Awards (2023) Best Vegan Down: Ponda BioPuff bulrush down<sup>24</sup>.

<sup>24</sup> PETAUK. (2023). PETA Fashion Awards 2023. Retrieved from <https://www.peta.org.uk/living/peta-fashion-awards-2023/>



BioPuff® Quilted Fabric by Ponda



BioPuff® Jacket by Ponda





Future Fashion Factory Director, Professor Stephen Russell speaking with Professor Ningtao Mao at the Future Fashion Factory Showcase 2023



A guest at the Future Fashion Factory National Wool Month Exhibition at Salts Mill, Saltaire.



Jacquard-made garments, Future Fashion Factory Year 1 Showcase.



Future Fashion Factory Co-Director, Suzy Shepherd speaking at the Future Fashion Factory Spring Expo 2024.





Guests at the Future Fashion Factory Year 1 Showcase.



Students at the Future Fashion Factory Competition for National Wool Month.



Yasmin Jones-Henry, FT Writer & Senior Strategist RÆBURN at the Future Fashion Factory Showcase 2023.



Guests at the Future Fashion Factory Year 1 Showcase.



# 5 Common Challenges & Opportunities



## Common Challenges & Opportunities

The CICP set out an ambitious programme to drive innovation and skills in the creative industries, approaching values, management and evaluation in a novel and collaborative manner. In this way R&D funding was made available to the creative sector through the commissioned R&D mechanism, this funding was intended to reach businesses that had previously found it very challenging to obtain support for R&D and innovation. The two F&T CRDP clusters, BFTT and FFF, designed different mechanisms to address this opportunity, capturing insights and recording challenges encountered by creative sector businesses along the way. Common learning is highlighted in this section of the report.

### 5.1 A Common Language, Aims and Objectives

Substantial and long-standing comment exists around the difficulties of communication between business, specifically SMEs, and academia<sup>25 26 27 28 29</sup>. Whilst most of the past work has focused on STEM-driven interventions, the experiences and learning from within the creative industry STEAM-focused CICP do have parallels with earlier findings. Specifically in terms of use of language and levels of understanding, resourcing and timeframes.

SMEs and their founders and owners are by nature entrepreneurial, often performing multiple, if not all roles required in a business (Leader, HR, Communications, Finance, Management, etc). This leaves very little capacity in terms of R&D or product development. To thrive, businesses need resources, both in terms of time and money, to develop. To improve their product and grow their customer base, create optimum structures for scale, invest in the right technology, develop business plans, and be ready for investment, they require the space to reflect on innovation across their target sector, as well as to develop truly collaborative relationships with appropriate innovation partners, including Universities. One common side effect noted by both CRDPs was that lack of time and understanding can have the tendency to make SMEs inward-facing, which in turn blurs the lines of understanding between innovation and business growth. An important part of project development support provided by both BFTT and FFF as CRDPs was teasing out what was ‘new to the applicant’ vs. ‘new to the sector’, in terms of innovative concept framing.

Whilst the CICP funding was designed to support businesses to develop their R&D innovation ideas, most SMEs required general business development support, as well as funding to bring them to market, and/or scale up production. Effective sign-posting between CRDPs and regional business support schemes helped to bridge this gap, but more work is required around aligning funding opportunities for F&T. Achieving further funding

25 Bertello, A. F., A.; De Bernardi, P.; Bertoldi, B. (2022). Challenges to open innovation in traditional SMEs: an analysis of pre-competitive projects in university-industry-government collaboration. *International Entrepreneurship and Management Journal*, 18, 89-104. Retrieved from <https://link.springer.com/article/10.1007/s11365-020-00727-1>

26 Boldrini, J. C. S.-B., N.; Chene, E. (2011). Improving SMEs' Guidance Within Public Innovation Supports. *European Planning Studies*, 19, 775-793. doi:10.1080/09654313.2011.561036

27 Huggins, R. J., A. (2009). Knowledge Networks in an Uncompetitive Region: SME Innovation and Growth. *Growth and Change*, 40, 227-259.

28 Molina-Morales, F. X. M.-C., L.; Capó-Vicedo, J.; Capó-Vicedo, J. (2022). The dynamizing role of universities in industrial clusters. The case of a Spanish textile cluster. *The Journal of the Textile Institute*, 113(11). doi:<https://doi.org/10.1080/00405000.2021.1980268>

29 Robson, P. J. A. B., R.J. (2000). SME growth: The relationship with business advice and external collaboration. *Small Business Economics*, 15, 193-208.



for R&D can be difficult for SMEs due to the restrictions imposed, e.g. in the KTP model, which framed BFTT interventions, businesses are currently required to have 10+ employees, which would have taken out 91% of the BFTT SME network from the applicant pool. Furthermore, capital funding is an ineligible cost for most funding bodies and calls, and this poses a challenge for SMEs whose business development often requires some level of infrastructure investment. Similarly, short, highly focused projects involving shorter bursts of academic staff support such as those provided by FFF, do not fit traditional academic research funding models and whilst useful for industry are challenging for university finance and research administration teams to implement.

Attention was also paid to embedding learning across both academic and industrial partners involved in CRDP project delivery. Fostering deeper understanding of the different drivers for each party, alongside working to break down barriers are essential to avoid stifling University-Industry relationships. Discussions around knowledge exchange mechanisms, intellectual property assignment and timescales were all areas that the CICIP investment enabled the CRDPs to address. Specific challenges identified were:

- Access to R&D funding opportunities for businesses, specifically SMEs with limited inbuilt capacity, is challenging because R&D application processes are resource heavy and time-consuming. A main target for the F&T CRDPs was to overcome the complex procedural challenges to support SMEs with no experience in applying for R&D grant funding.
- Coupled with the restrictive scope for in-kind or investment support required of SMEs to qualify for grant funding, many SMEs simply cannot afford to provide upfront cash or allocate the time needed to prepare proposals. The BFTT and FFF brokerage mechanisms successfully filled this F&T sector-specific, business support gap.
- The time required from HEI staff, both in terms of academic team members and central administrative support, is considerable and not all sunk costs are recoverable through current UKRI funding mechanisms. Whilst grant funding readily aligns academic expertise to deliver research projects, the professional service required to ensure consistent project management, and coordination of new opportunities, matched with SME challenges is rarely funded through current mechanisms. Where this programme management is eligible expenditure, it does not attract full recoveries making project lead roles less financially attractive to research-intensive universities.
- There is a misalignment between the speed of business serving commercial markets and HEI research serving academic publications. HEIs and companies are bound by complex legal and financial structures, but the responsiveness of each is quite different. This is more apparent between HEIs and start-ups/SMEs, than between HEIs and large corporate organisations. The time associated with due diligence and internal regulation requirements when contracting commissioned R&D, as well as IP management is significant.
- The involvement of sector-specialists to act as brokers for HEI's working with industry, is a central feature of successful CRDP regional, cluster-based R&D and innovation. However, this is reliant on individual HEIs having both

the wide-ranging expertise, the will and the resources to fully embrace this opportunity. Both BFTT and FFF have embedded these requirements by forming new industry-led, F&T research institutes in which staff appointments have been made to provide ongoing brokerage with industry, and the existing cluster networks continue to be developed, beyond the end of the CICIP funding.

## 5.2 Brokerage Requirements

Bridging the language gap and aligning goals, in terms of both partner acceptable outcomes and timeframes, has been a key element of both F&T CRDPs. BFTT and FFF provided brokerage in different ways to ease this process. FFF employed a sector expert already well-known to the industry cluster, and skilled in supporting F&T funding schemes. Additionally, an experienced programme manager was put in place with a significant track record of bid writing and fund management. Furthermore, FFF was led by a senior academic with significant F&T industry experience at Director level, enabling excellent two-way communication and alignment of academic-industry needs in the structure and operational delivery of the CRDP. BFTT employed cross sectoral R&D expertise skilled in supporting F&T SME interests, who convened an R&D delivery team drawn from a pool of UAL and Loughborough University Knowledge Exchange staff provision. A central programme manager convened interdisciplinary expertise and skills from across the HEI R&D partnership. BFTT was led by a senior academic with long established F&T industry experience, tasked with brokering development of a specialist R&D innovation ecosystem across an emergent HE and local Government partnership, embedding itself in East London by 2024.

The brokerage support was focused on:

- Understanding business drivers and recommending appropriate academic input and expertise.
- Providing guidance to frame impactful research questions/propositions.
- Supporting the preparation of funding applications - both for CICIP funded and follow-on activity.
- Connecting businesses into wider F&T ecosystems, including business representation across F&T value chains involving, start-ups, SMEs, large multinational companies, and sector bodies.
- Representing F&T interests across local and national Government, and related organisational contexts, and informing F&T related policy.

By delivering this level of support, HEIs are entering a different operational and public position, moving from reactive participants in externally framed funding programmes, to proactive players, designing and delivering targeted sectoral interventions. Direct relationships and funding partnerships with businesses have proven, through the CICIP, that innovation can be accelerated with positive impact for businesses via job creation, new product creation and income generation.

Considering the wider role of HEIs as funding brokers in the context of the



- CICP commissioned R&D strand, the benefits of this system include:
- Targeted sectoral support providing an in-depth knowledge and understanding of the industry, in this case F&T.
  - Providing a platform to develop advanced knowledge in target sectors, providing a foundation for truly impactful future projects, research, and consultancy.
  - Enabling research-led teaching (UG & PG programmes), and so equipping future graduates with knowledge of current industry drivers and best practice. Leveraging resources for the development of valuable teaching initiatives such as new courses (including CPD), case studies, student projects, visits and work-placements, library resources, presentations and talks.
  - Incentivising business connectivity with regional, and national, knowledge bases, furthering academic links with external institutions.
  - Supporting Research Excellence Framework (REF) and Knowledge Exchange Framework (KEF) activity by providing rich material for high quality academic papers and impact case studies.

5.3 Skills Development

The reduced financial investment in the arts and humanities as subject areas<sup>30 31</sup> and policy changes such as Brexit, have and will continue to have a lasting impact on the F&T industry. An evidenced skills shortage as a result of Brexit<sup>32 33</sup> reduced student numbers, courses and resources across secondary education, along with the insecure work that is often associated with working in the arts (51.2% of fashion/clothing designers being self-employed freelancers<sup>34</sup>) have created a perfect storm in which the skills required of tomorrow have not been invested in today. SMEs engaged in the clusters programme have felt the impact of the skills shortage, identifying skills diversification, retention and futureproofing as urgent priorities.

Addressing F&T sector skills requirements was built into the FFF programme from the outset, both in terms of HEI (Undergraduate and Postgraduate) and apprenticeship provision. Both UKFT, as the national skills sector body for F&T, and the Textile Centre of Excellence (TCoE) a regional skills and apprenticeship provider in textile manufacturing skills, contributed as partners and members of FFF’s Advisory Board, enabling a sharp focus on industry requirements for training development. The collaborative R&D and innovation resulting from the FFF programme also informed HEI degree programme developments, as well as developments in CPD training. The launch of a new BSc Textile Innovation and Sustainability<sup>35</sup> is one example that forms a tangible legacy of the programme. Co-developed with industry, working closely with UKFT, and financially supported by the Textile Livery

Group<sup>36</sup> and UK SMEs, significant industry sponsorship has been provided for scholarships supporting incoming students.

In terms of impact, the BFTT proposal identified the need for skills development at every level and this was one of the objectives of the UAL FTTI once established in the new campus at the QEOP. The R&D arising from BFTT, and ongoing innovation is informing development of collaborative and Design+STEM specialist MRes provision across UAL’s Institutes, aligning to the recently launched Doctoral Training School. Also in development is a series of CPD and short courses to meet the needs of both industry and UAL’s extensive technical provision. The BFTT has provided material for the development of valuable teaching resources such as case studies, student projects, visits and work-placements, library and archive resources, presentations and talks, enriching delivery of curriculum across undergraduate (BA, BSc), post-graduate (MA, MSc) and research study programmes across the CRDP. The HE and FE partnership arising from BFTT newly situated at the QEOP is also providing the opportunity for novel cross institutional curriculum in development at every level including UG and PG, advancing academic links across Design, STEM and Humanities HE disciplines, and institutions.

5.4 Changing Legislative and Political Landscape

The F&T industry is facing an increasingly challenging regulatory landscape nationally and internationally, including the introduction of extended producer responsibility (EPR) in some regions, which will continue to strongly influence the focus of innovation in the future. A further issue relates to the development of science-based eco-metrics and eco-credentials, as well as greater scrutiny on business about ‘green claims’. Particularly for SMEs, collaborative R&D and innovation support is required to address the resulting challenges, as well as to ensure the UK industry can shift to a sustainable development track that is consistent with mandated net-zero goals.

Eco-credentials

Achieving sustainability credentials in a saturated certification environment – there are at least 107 different eco-credentials available across the F&T industry<sup>37</sup> – is an expensive activity. Eco-credentials themselves may prove to be a driver towards positive change, but only if consistently understood and implemented, and based upon credible data, which in many cases is not forthcoming. Start-ups and SMEs find the landscape particularly challenging with recent F&T industry entrants (highlighted in this report) such as Amphico, Ananas Anam, Materra and Ponda, needing to carefully navigate the certification landscape. There is growing industry concern that eco-credentials are not fit for purpose, providing more confusion than they do certainty to consumers, and their lack of consistency is supporting an

30 Ashton, H. B., D.; Gamble, J.; Stavrou, M. (2024). *The State of the Arts*. Retrieved from University of Warwick: <https://wrap.warwick.ac.uk/id/eprint/188562/1/The-State-of-the-Arts.pdf>

31 Harris, G. (2021). UK government approves 50% funding cut for arts and design courses. *The Art Newspaper*. Retrieved from <https://www.theartnewspaper.com/2021/07/22/uk-government-approves-50percent-funding-cut-for-arts-and-design-courses>

32 Haddoud, M., Y. F., I.; Murphy, T. (2023). *Post-Brexit migration and accessing foreign talent in the Creative Industries*: Creative Industries Policy and Evidence Centre (PEC)

33 Hemingray C., Vecchi A., Bonnetti, F., Toms, S., Bulman, S., Connor-Crabb, A., Guo, Y. Silva, E. S., Solomon, L. (2023). *Impact of Brexit and Covid-19 on the UK Fashion and Technology Ecosystem*. Retrieved from Online: <https://ukft.org/report-brexit-covid-bftt-fff/>

34 Easton, E. C.-F., E. (2017). *Creative Freelancers*. P.34: Retrieved from Creative Industries Federation website: <https://www.creativeindustriesfederation.com/sites/default/files/2017-07/Creative%20Freelancers%201.0.pdf>.

35 University of Leeds, retrieved from <https://courses.leeds.ac.uk/j761/textile-innovation-and-sustainability-bsc>

36 UKFT, ‘Scholarships available for second cohort of the BSc Textile Innovation and Sustainability course’, 2024, retrieved from <https://ukft.org/scholarships-bsc-textile-innovation/>

37 Kesidou, E. P., C. (2024). *Eco-Credentials in the Fashion and Textile Industry Assessment and Evaluation: A Review of Eco-Credentials, their Strengths and Weaknesses, and Recommendations for Improvement*. Retrieved from [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=5052003](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5052003)



uneven global playing field which is difficult to navigate<sup>38</sup>. Concerns are not just limited to voluntary sustainability measures, but legal definitions and requirements have not kept up with new material innovations, stifling growth and opportunities for new companies operating in this ecosystem. It is reasonably common that large F&T companies will not buy from suppliers who do not comply with their selection of eco-credential subscriptions, putting a further market barrier in place for SMEs.

The challenge for SMEs is twofold; a) Certifications are often prohibitively expensive, and b) Certifications do not keep up with innovation, meaning that new materials (for example) are not recognised as being approved, limiting potential market development.

**Policy changes**

A level global playing field for F&T businesses is perhaps the most important factor for the sector, although arguably the least easy to influence. Having geographically distributed supply chains makes F&T particularly vulnerable to global events, a fact that Brexit highlighted in 2020 and has been further reinforced by US policy on global tariffs<sup>39 40 41</sup>. Whilst Brexit effectively disrupted the UK’s access to the world’s largest trading bloc (440 million consumers)<sup>42</sup>, recent US actions have highlighted the potential for a single large market change, to radically impact global levels of confidence and readiness to invest. Whilst Brexit resulted in a focus on opening new markets outside of the EU by necessity, many businesses reduced or stopped trading in the UK as a response. The fallout from US tariffs is yet to be determined, but will certainly encourage greater supply chain security, both domestically and with the UK’s closest neighbours.

Such global shocks inevitably trigger reflections on prospects for near-shoring, or onshoring. Case study examples include re-development of skills for lost manufacturing techniques (iinouiio), reliance on more local supply chains (Dopplehaus), domestic innovation in the design of materials and processes (Amphico, Materra, Ponda) and building capacity for the UK to recycle its own waste (Project Plan B). These opportunities however, will not be possible to fully exploit without UK investment in innovation/R&D funding as well as constructive developments in UK policy. The development of a well-designed UK extended producer responsibility (EPR) scheme, for example, specifically for F&T could generate significant funds to support new materials, process and product innovation, as well as to invest in the UK’s end-of-life F&T waste management infrastructure.

38 Connor-Crabb, A. Bulman., S.; Bunyan, C.; Guo, Y; Hulme, A.; Rainton, S.; Solomon, L.; Toms, S. (2025). *Sustainable and Circular Practices in the UK Fashion and Textiles Industry*. Retrieved from University of Leeds website; White Rose repository  
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41 UKFT. (2025, 03-Apr-2025). UKFT update on US tariffs (April 2025). Retrieved from <https://ukft.org/us-tariffs-april25/>  
42 EC. (2025). EU position in world trade.



# Recommendations



## Recommendations

- **Future R&D initiatives** that aim to accelerate high impact innovation and economic growth in the F&T industry **should harness learning from existing Creative R&D Partnerships (CRDPs) and their established networks, infrastructure and market access.** CRDPs should assist with identifying opportunities and the distribution of collaborative R&D funds.
- **Commissioned R&D mechanisms with subject-specific wraparound business support should be embedded in future academic-industry collaborative funding initiatives.** Developed by both F&T CRDPs this approach was the single largest enabler of engagement for SMEs who had no previous experience or access to university academic R&D support.
- **Research challenges and innovation gaps for collaborative R&D projects involving companies should be co-created and co-developed to ensure they reflect real unmet industry needs,** and to maximise mutual commitments to objectives. The HEI role as a convenor for these should be recognised. This is different to HEI-led projects focused on academic concepts that are 'in search of a home' in industry.
- **Intellectual Property generated from industry-led collaborative funded programmes should be available for market exploitation.** The Industrial Strategy Challenge Fund driven presumption that the industrial partner would retain the right to exploit IP should be embedded within future funding programmes. Where significant HEI know-how informs project foreground there should be recognition of that fact within commercialisation agreements.
- **Where R&D funding is only part of the solution for a company, the brokerage provided should be capable of signposting to other forms of support,** complementary industry partners or other relevant opportunities. This applies also to unsuccessful applicants following Responsive R&D calls who may not be able to progress without appropriate guidance.
- Financial challenges faced by the university sector need to be reflected within funder terms and conditions. Funding allocations should not be formulated in such a way as to disincentivise research intensive HEIs from leading on major research collaborations. **A mechanism for funding professional support staff, specifically brokerage activity and programme management, to cover all employment costs should be implemented.**
- When seeking to address large scale sectoral challenges, such that a single company or small group of collaborators cannot reasonably be expected to solve the challenge alone, funding should consider all players within F&T ecosystem. **Research Council funder terms and conditions should consider funding levels for start-ups/micro-SMEs/large company and sector bodies alongside academic institutions, for appropriate holistic supply chain interventions.**



- The requirement for UK micro-companies and SMEs to provide match funding to participate in collaborative R&D projects with universities, even of short duration, is a major barrier to engagement. To remove this blockage whilst maintaining robust oversight and governance **future funding should provide for greater flexibility toward match funding requirements.** The collaborative R&D funding mechanisms developed by the F&T CRDPs provide examples of engagement.
- A balance of revenue and/or capital interventions should be considered across a particular challenge area. This is of specific importance when considering follow-on funding to scale innovations, **preferential intervention rates for SMEs and/or a mixture of grant and equity funding options should be available.**
- Skills, both in terms of futureproofing and retention, are of critical importance to the F&T industry. Future initiatives should consider integration of skills and education at all levels (school age through to CPD) as a cross-cutting theme within future funding schemes. **Planned programme outcomes should have a mandated interdisciplinary skills intervention element.**



# Special Thanks



iinouio - yarn spun from high quality post-consumer feed stock. © Alys Tomlinson

## Special Thanks

With special thanks to all the fashion and textile businesses who gave their time to take part in this research and provided so many valuable insights. Businesses featured in case studies listed in alphabetical order below with corresponding web addresses.

|                            |                                                                    |
|----------------------------|--------------------------------------------------------------------|
| Abraham Moon               | <a href="http://www.moons.co.uk">www.moons.co.uk</a>               |
| Amphico Ltd                | <a href="http://www.amphico.uk">www.amphico.uk</a>                 |
| Ananas Anam                | <a href="http://www.ananas-anam.com">www.ananas-anam.com</a>       |
| AWAYTOMARS                 | <a href="https://awaytomars">@awaytomars</a>                       |
| Doppelhaus                 | <a href="http://www.doppelhaus.co.uk">www.doppelhaus.co.uk</a>     |
| Hylo Athletics             | <a href="http://www.hyloathletics.com">www.hyloathletics.com</a>   |
| iinouio Ltd (Camira Group) | <a href="http://www.iinouio.com">www.iinouio.com</a>               |
| Joshua Ellis & Co          | <a href="http://www.joshuaellis.com">www.joshuaellis.com</a>       |
| Mattera                    | <a href="http://www.mattera.tech">www.mattera.tech</a>             |
| Ponda                      | <a href="http://www.ponda.bio">www.ponda.bio</a>                   |
| Project Plan B Ltd         | <a href="http://www.projectplanb.co.uk">www.projectplanb.co.uk</a> |
| Segura                     | <a href="http://www.segura.co.uk">www.segura.co.uk</a>             |

Authors: Rainton, S., Harris, J., Russell, S. J.

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