

CRAFT IT 4 SD

Craft Revitalization Action
for Future-proofing the Transition
to Innovative Technologies
for Sustainable Development



Deliverable D6.2

Learning Ecosystems/Hubs Report-Draft

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Contents

Document Information.....	2
Executive Summary	7
1 Overview of the CRAFT-IT4SD Learning Ecosystem (Deliverable D6.2)	8
1.1. Aim of the report.....	8
1.2. WP6-Skills and learning communities across fashion and related CCSI - Objectives and Tasks.....	10
1.3. Timetable. Deliverables and Milestones.....	10
1.4. Partners	13
2. CRAFT-IT4SD Learning Community across fashion and related CCSI (task 6.1)	14
3. Exchanging good practices and peer learning for creative industries – Training Workshops (task 6.2) 24	
3.1. Introduction.....	24
3.2. Overview of the training workshops.....	25
3.3. Learning insights of the training workshops.....	33
3.3.1. First iteration of the training workshops.....	33
3.3.2. Second iteration of the training workshops	33
3.3.3. Third iteration of the training workshops	34
3.4. CRAFT IT4SD good practice: An iterative learning journey through training workshops	34
3.5. Training methodology adopted by the CRAFT-IT4SD consortium.....	35
4. Development of Learning Ecosystems/Hubs for fashion and related CCSI (task 6.3).....	38
4.1. The methodology	38
4.1. Set up the Learning Ecosystem Teams (LET)	38
4.2. Action Plan developed by the CRAFT-IT4SD Learning Ecosystem	39
4.3. How the Action Plan (AP) ensure the sustainability of the CRAFT-IT4SD Learning Ecosystem	40
4.4. Building capacities for CRAFT-IT4SD Learning Ecosystem/Hub	42
4.5. Development, validation and refinement of the CRAFT-IT4SD micro-credentials.....	43
4.6. Why are the CRAFT-IT4SD micro-credentials innovative?	46
5. CONCLUSIONS.....	47
References.....	49
ANNEX 1 – Contribution to the Learning Community.....	51
ANNEX 2- CRAFT-IT4SD MICROCREDENTIALS.....	77
Combining Craft with Digital Technologies for Sustainability in Garment Design and Consumer Approaches – part 1: The Thing from the Future	77

CRAFT IT 4 SD

Craft Revitalization Action
for Future-proofing the Transition
to Innovative Technologies
for Sustainable Development

Combining Craft with Digital Technologies for Sustainability in Garment Design and Consumer Approaches – part 2: Material Driven Design	80
Combining Craft with Digital Technologies for Sustainability in Garment Design and Consumer Approaches – part 3: Body Driven Design	84
The Red Thread of Sustainability – Crafts, Culture, and Creativity Driving Regenerative Actions for Fashion and Textile	87
Fashion of the Future: Pioneering Digital and Sustainable Business Models with Legislative Integration	102
Sustainable Smart Textiles: Printed Electronics for Fashion and Craft Innovation	110
Additive Manufacturing and 3D Printing for Sustainably Crafted Capsule Collections	113

List of Figures

- Figure 1.1: Overview of objectives and deliverables of WP6
- Figure 1.2: Overview of tasks of the WP6
- Figure 1.3: WP6 - Relationship among tasks, outputs and impacts on the learning ecosystem
- Figure 2.1. CRAFT-IT4SD LinkedIn page
- Figure 2.2. Knowledge flow within the CRAFT-IT4SD Learning Ecosystem
- Figure 2.3. Distribution of the knowledge resource files by Learning Community theme
- Figure 2.4. Interconnected knowledge domains covered by the Learning Community.
- Figure 3.1. CRAFT-IT4SD training workshops: Overview of the participants. Target and impact quantitative indicators.
- Figure 3.2. CRAFT-IT4SD training workshops: Objectives, topics and educational outcomes
- Figure 4.1 Craft-IT4SD methodology for capacity building of the Learning Ecosystems

List of Tables

- Table 1.1 Key indicators achieved by the CRAFT-IT4SD Learning Community.
- Table 2.1. Evolution of knowledge production across the project iterations.
- Table 2.2 lists the resources included in the Learning Community archive
- Table 2.3. Knowledge production by the Learning Community theme.
- Table 3.1. 1st iteration of the Training Workshops
- Table 3.1. 2nd iteration of the Training Workshops
- Table 3.1. 3rd iteration of the Training Workshops
- Table 3.4. CRAFT-IT4SD training workshops: Objectives, topics and educational outcomes
- Table 4.1. Action Plan proposed by the CRAFT-IT4SD consortium

List of Abbreviations

AI	Artificial Intelligence
AIDC	Automatic Identification and Data Capture
AR	Augmented Reality
CCSI	Cultural and Creative Sectors and Industries
CLO3D	Computer-aided 3D Fashion Design Software
CSRD	Corporate Sustainability Reporting Directive
DPP	Digital Product Passport
EC	European Commission
ECTS	European Credit Transfer and Accumulation System
EDCI	European Digital Credentials for Learning
EQF	European Qualifications Framework
ESCO	European Skills, Competences, Qualifications and Occupations
ESPR	Ecodesign for Sustainable Products Regulation
EU	European Union
HEI	Higher Education Institution
LET	Learning Ecosystem Team
MC	Micro-credential
NFC	Near Field Communication
OER	Open Educational Resources
R&D	Research and Development
RFID	Radio Frequency Identification
SME	Small and Medium-sized Enterprise
TCLF	Textile, Clothing, Leather and Footwear
VET	Vocational Education and Training

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for Future-proofing the Transition
to Innovative Technologies
for Sustainable Development

VR Virtual Reality
WP4 Work Package 4 of the CRAFT-IT4SD project
WP6 Work Package 6 of the CRAFT-IT4SD project

Executive Summary

This deliverable presents the final report for **Deliverable D6.2 – Learning Communities, Training Workshops and Learning Ecosystems for Fashion and Related Cultural and Creative Sectors and Industries (CCSI)**, developed within Work Package 6 (WP6) of the Horizon Europe project **CRAFT-IT4SD**. The report documents the implementation, achievements and outcomes of the activities carried out under Tasks 6.1–6.4 and demonstrates how the project transformed pilot experiences into a transferable European learning model supporting knowledge transfer, skilling, upskilling and reskilling for the fashion sector and the CCSI.

Building upon the educational framework, methodologies and curricula developed in previous project work packages, particularly the pilot activities implemented in WP4 and the micro-credential curricula developed, this deliverable analyses how these research outcomes were translated into collaborative learning environments, training methodologies and practical educational resources. The report therefore focuses not only on the implementation of WP6 activities, but also on their contribution to the long-term sustainability and exploitation of the project results.

The principal audience for this deliverable includes the European Commission, project partners, higher education institutions, vocational education and training (VET) providers, SMEs, designers, craftspeople, researchers, innovation organisations, and policymakers interested in competence development for the green, digital, and social transition of the fashion ecosystem. In addition, the methodologies and recommendations presented are intended to support organisations seeking to establish collaborative learning environments, develop flexible educational programmes or implement competence-based training within the Cultural and Creative Sectors and Industries (CCSI).

The report presents the establishment and evolution of the **CRAFT-IT4SD Learning Community**, which developed into a European knowledge ecosystem connecting education providers, researchers, designers, craftspeople, SMEs and students through four thematic communities and a cross-cutting knowledge stream. The deliverable documents the production of 36 knowledge resources, demonstrating how the Learning Community evolved from a communication platform into a sustainable mechanism for peer learning, interdisciplinary collaboration, and dissemination of project outcomes.

A second major component of the deliverable concerns the **Training Workshop** program organised through three iterative learning cycles. The report analyses how these workshops progressively transformed research findings and pilot experiences into transferable educational resources by moving from awareness and exploration, through experimentation and co-creation, to the integration and validation of innovative practices. This iterative approach resulted in a coherent European learning journey that supports competence development through challenge-based, interdisciplinary and experiential learning.

The deliverable further presents the development of **CRAFT-IT4SD Learning Ecosystem**, illustrating how collaboration between higher education institutions, SMEs, craftspeople, designers, researchers and regional innovation stakeholders can strengthen knowledge exchange and accelerate the adoption of sustainable and digital innovation. It also reports on the validation and refinement of the CRAFT-IT4SD micro-credentials, demonstrating how flexible, competence-based learning pathways were progressively improved through pilot implementation, stakeholder engagement and continuous feedback from the Learning Community and the Training Workshop series.

Beyond documenting project activities, Deliverable D6.2 provides several transferable outputs that support CRAFT-IT4SD's long-term impact. These include:

- ✓ the CRAFT-IT4SD Learning Community model,
- ✓ the methodology for the iterative Training Workshop program,
- ✓ the Learning Ecosystem framework that was built as interconnected learning hubs in the partner organisations of the consortium, corresponding to the pilot sites in WP4: Denmark, Finland, Romania and Spain,
- ✓ the repository of knowledge resources, such as training materials, presentations, videos, games, project works,
- ✓ the recommendations for future educational programmes, and validated approaches for integrating sustainability, digital technologies, cultural heritage and entrepreneurship into competence-based learning.

Together, these outputs establish a scalable educational model that can be adopted by higher education institutions, vocational education and training providers, SMEs and innovation ecosystems, contributing to the resilience, competitiveness and sustainability of the European TCLF sector and the wider Cultural and Creative Sectors and Industries.

1 Overview of the CRAFT-IT4SD Learning Ecosystem (Deliverable D6.2)

1.1. Aim of the report

CRAFT-IT4SD project aims to activate the **Cultural and Creative Sectors and Industries (CCSI)** towards the green transition by building on rich cultural heritage and strong creative traditions. To achieve this aim, the consortium acts to:

- revitalise knowledge, practices, and traditional crafts as shared cultural resources for sustainability by combining techniques and skills associated with emerging digital technologies and data analytics processes and services;
- explore cross-sectoral CCSI innovation through a new ecosystem approach and with four pilot clusters in Denmark, Spain, Finland, and Romania, where regional governance, public-private partnerships, entrepreneurial living labs, learning communities, and consumer-engagement approaches support shared experimentation towards the green transition.
- adopt a new ecosystem approach to facilitate co-creation between traditional craft stakeholders, the fashion industry, SMEs, designers, artisans, and artists through immersive media technologies.
- to replicate insights, learnings and tangible results leading to a CCSI-driven green transition.

Deliverable D6.2 presents the final outcomes of Work Package 6 (WP6) of the CRAFT-IT4SD project, documenting the implementation, validation, and transferability of the learning methodologies developed to support the green, digital, and social transition of the fashion sector and the Cultural and Creative Sectors and Industries (CCSI). Building upon the pilot activities implemented in Work Package 4 and the educational framework developed throughout the project, the deliverable demonstrates how research outcomes were transformed into collaborative learning environments, transferable educational resources and competence-based learning pathways.

The report presents the evolution of the **CRAFT-IT4SD Learning Ecosystem**, developed through the collaboration of partner organisations in Denmark, Finland, Spain and Romania. Rather than describing isolated activities,

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to Innovative Technologies
for Sustainable Development

Deliverable D6.2 illustrates how the different components of WP6 were progressively integrated into a coherent European learning model that combines knowledge exchange, experiential learning, competence development and collaborative innovation. The resulting framework establishes a scalable approach to knowledge transfer, skilling, upskilling, and reskilling that can be replicated by higher education institutions, vocational education and training providers, SMEs, and regional innovation ecosystems.

The deliverable is organised around four complementary components that together define the **CRAFT-IT4SD capacity building and its learning model**:

The first component presents the **CRAFT-IT4SD Learning Community**, established as a sustainable European platform for peer learning and interdisciplinary collaboration. Organised around four thematic communities—**Innovative Business Models**, **Wardrobe for Sustainability**, **Empowering Consumers**, and **Crafts & Emerging Technologies**—the Learning Community evolved into an active knowledge ecosystem that supports dialogue among educators, researchers, designers, craftspeople, SMEs, and students. Through thematic discussions, pilot dissemination activities, and the publication of knowledge resources, it contributed to the ongoing exchange of expertise and the creation of a permanent Knowledge Observatory for the project.

The second component reports on the **Training Workshop** series, comprising sixteen learning-based activities as workshops, hands-on and ateliers organised through three iterative learning cycles. Rather than functioning as independent events, the workshops formed a coherent educational pathway in which participants progressively moved from awareness and exploration, through experimentation and co-creation, to the integration and validation of innovative solutions. The workshops combined sustainability, circular economy, digital technologies, cultural heritage and entrepreneurship within challenge-based learning environments, demonstrating the value of experiential and interdisciplinary education.

The third component analyses the development of the **CRAFT-IT4SD Learning Ecosystems** and the validation of the project's **micro-credentials**. Through the work of the **Learning Ecosystem Teams** and continuous stakeholder engagement, flexible and competence-based learning pathways were refined to address emerging professional needs in sustainability, digital innovation, additive manufacturing, smart textiles, cultural heritage, and new business models. The report demonstrates how iterative piloting, collaborative curriculum development and continuous feedback strengthened both the educational content and its relevance for future learners and employers.

Finally, the deliverable presents the mechanisms developed to ensure the **transferability, replication and long-term sustainability** of the CRAFT-IT4SD learning model. These include common methodological frameworks, monitoring and evaluation tools, recommendations for educational practice, and the **CRAFT-IT4SD Playbook**, which captures the methodologies, lessons learned and good practices emerging from the project. Together, these outputs provide a practical framework to support future educational initiatives and extend the project's impact beyond its duration.

Overall, Deliverable D6.2 demonstrates how CRAFT-IT4SD successfully transformed pilot experimentation into a **European Learning Ecosystem** in which collaborative learning, knowledge resources, Training Workshops, Learning Ecosystems, and micro-credentials operate as interconnected elements of a transferable educational model. By integrating sustainability, digital technologies, cultural heritage and innovation within a coherent lifelong learning framework, the deliverable provides a scalable methodology that supports the resilience, competitiveness and future skills development of the European fashion ecosystem.

1.2. WP6-Skills and learning communities across fashion and related CCSI - Objectives and Tasks

Within the framework of the 6th Working Package, the CRAFTIT-4SD consortium developed a **capacity-building model** to ensure that the project outputs evolve into a durable, scalable, and viable Learning Community that supports emerging skills development, upskilling and re-skilling in fashion and related CCSI. The WP6 activities were structured as an integrated sustainability pathway, aiming at:

- *establishing the collaborative knowledge base* with task T6.1. Creating Learning Communities across fashion and related CCSI;
- *generating applied experimentation through training workshops*, within the T6.2. Exchange Good Practices and Peer Learning for Creative Industries by Training Workshops;
- *consolidating several validated practices into structured Learning Ecosystems* by task T6.3. Development of Learning Ecosystems/Hubs for Fashion and related CCSI);
- *ensuring documentation, transferability, and sustainability* alignment through the Playbook within the task T6.4. Develop a Playbook of Good Practices for Emerging Skills in fashion and related CCSI.

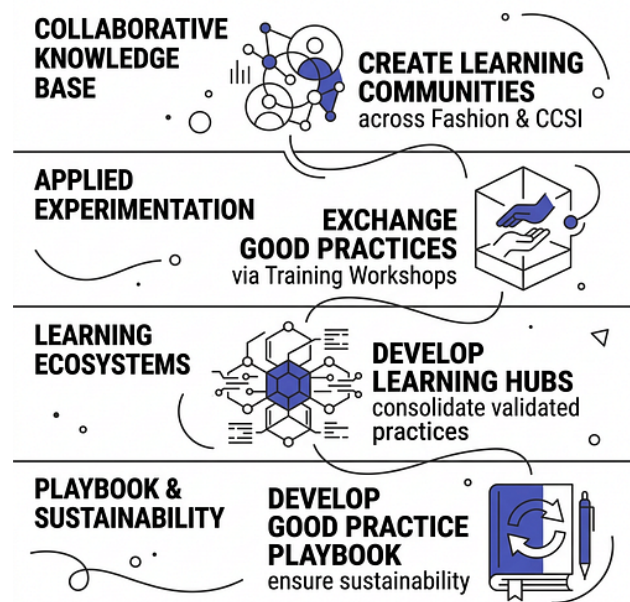


Figure 1.1: Overview of objectives and deliverables of WP6
(AI generated by gamma.app)

The **CRAFT-IT4SD Learning Ecosystems/Hubs** were designed as a **functional service** and are based on the activities of four fashion and CCSI communities among the consortium partners in Denmark, Spain, Finland, and Romania, working together to bridge educational innovation and real-world application through blended learning methods, among traditional, crafted, and innovative digital technologies. The outcomes of WP6 provide a design journey capable of setting up, activating, and scaling collaborative learning communities; learning plans and actions; micro-credentials; and new learning pathways. Four **Learning Ecosystem Teams** (LETs) were formed, and four **Action Plans** were released to enhance **capacity building, training design, and micro-credential integration**. These plans laid the foundation for interactive, modular learning content, including case studies, manuals, and game-based educational tools.

1.3. Timetable. Deliverables and Milestones

WP6, titled **Skills and learning communities across fashion and related CCSI**, supports the development of CCSI cross-sectoral learning ecosystems by delivering interactive Open Education Resources (OER) for upskilling and reskilling, which are tested and implemented in pilot sites and across pilots to enable intra-pilot communication. Three deliverables (6.1, 6.2, 6.3) and intermediate milestones (MS16, MS17, MS18, and MS19) were achieved.

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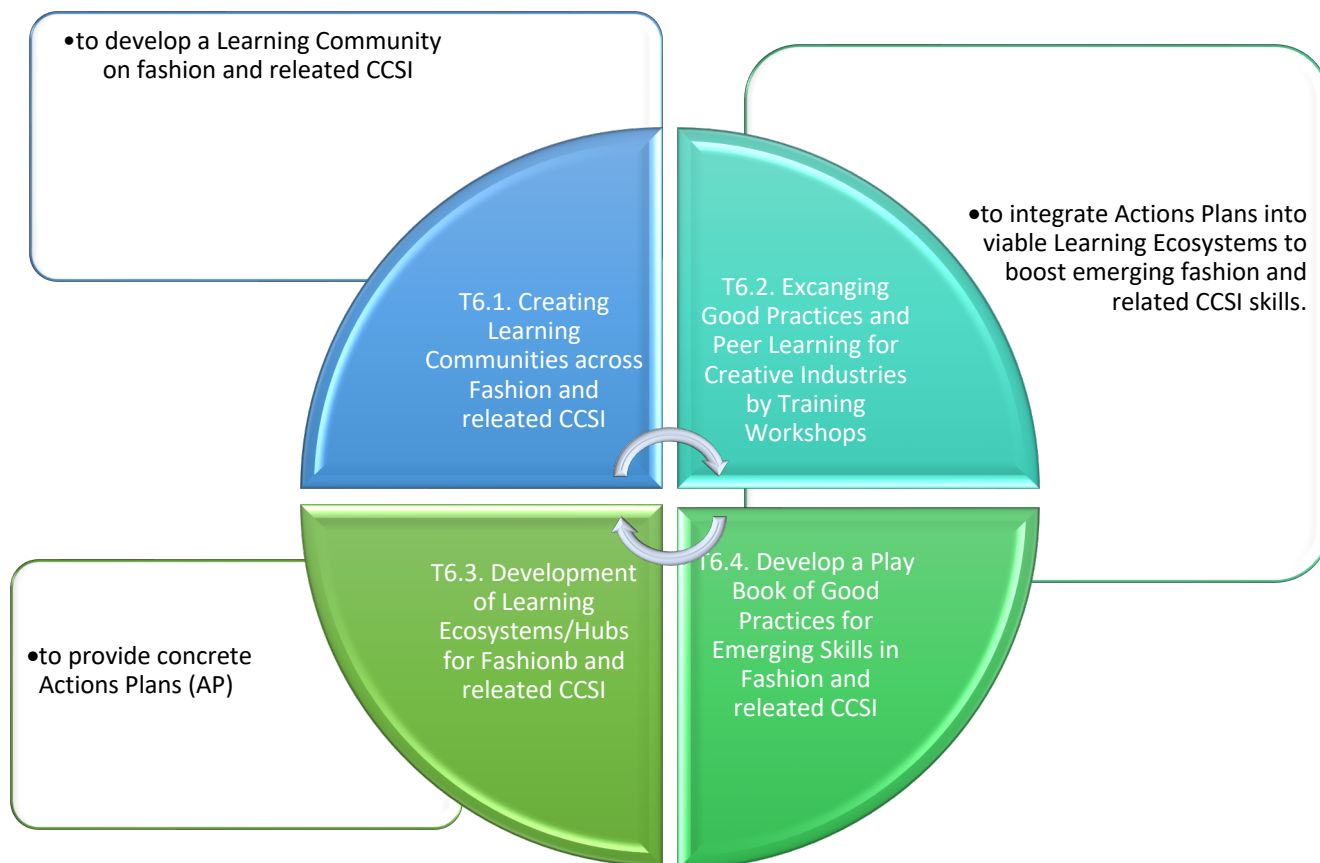


Figure 1.2: Overview of tasks in WP6

During the project implementation, WP6 made substantial contributions to the CRAFT-IT4SD objectives by developing collaborative structures, training activities, and learning frameworks. The work was structured around four main tasks (see Figure 1), each addressing key aspects of skills development and knowledge exchange across the creative and cultural sectors.

Deliverables/Associated Milestones from the handbook (D1.1)	Title	Due Date (month)	Means of verification
MS 6.1/ MS15	Create a learning community across fashion and related CCSI	12	A collaborative virtual learning community is established.
D6.1	Learning ecosystems/Hubs report interim for Stakeholder validation	14	A learning service that integrates members of a learning community, providing interactive content-based training methods structured into micro-credentials-based curricula allowing creative blended learning.
MS 6.2/ MS16	Submit the Reports on Training workshops to exchange good practices and peer learning for CCS	26	Training workshops completed (T6.2); creative business people, innovation leaders, stakeholders and pilot partners attended.

MS 6.3 / MS17	Set up teams and develop action plans for capacity building of the Learning Ecosystems	10	Developed methodology applied to each of the four Learning Ecosystems
MS 6.4/ MS18	Release the first draft of the Learning Ecosystems	20	The draft Learning Ecosystem has been released.
D6.2	Learning ecosystems/Hubs report final	30	Learning ecosystems/Hubs report final
MS 6.5/ MS19	Release the first draft of the playbook	28	Playbook of best practices for emerging skills in CCSI - first draft.
D6.3	Playbook of good practices for emerging skills in fashion and related CCSI	31	An interactive, game-based playbook presenting the project's core processes and good practices, skills-related results, experiences and lessons learnt from the piloting, along with concrete action plans.

Table 1: WP6 planning overview- Timeline, Deliverables and Milestones

This report covers the period from M3, when WP6 was launched, to M30, when the third series of training workshops was conducted, and accompanies all 3 iterations of the Pilots in WP4. It provides an integrated Capacity Building framework based on structured and elaborated **Action Plan**, consisting of seven sub actions (**APs**), to ensure the further sustainability of the CRAFT IT4SD Learning Community and to clearly link the Learning Community knowledge sharing (T6.1, the training workshops program (T6.2) with long-term Learning Ecosystem development (T6.3/ Deliverable D6.2) and the Playbook (T6.4/ Deliverable D6.3). This report was built upon the implementation of Task T6.2. Exchange Good Practices and Peer Learning for Creative Industries by Training Workshops. The primary aim of this report is to:

- ✓ demonstrate how the training workshops act as learning pathways, generating validated good practices and emerging skills for CCSI.
- ✓ convert the outputs (training materials, presentations, experiences, exercises, pictures, videos etc.) of the training workshops into learning tools to be used further by the CRAFT-IT4SD Learning Ecosystem, and beyond.

Deliverable D6.2 builds upon the foundations established in the intermediate report ([Deliverable D6.1](#)), which defined the methodological framework, implementation strategy and common operational tools for Work Package 6. While D6.1 focused on planning the Learning Community, the Training Workshop program, the Learning Ecosystem Teams (LETs) and the development of Action Plans (APs) and micro-credentials, the present deliverable documents their implementation, validation and outcomes. It reports on the evolution of these activities throughout the project, demonstrating how the initial concepts, methodologies and action plans were progressively refined through pilot implementation, collaborative learning, stakeholder engagement and iterative evaluation.

Consequently, Deliverable D6.2 moves beyond the planning phase to present the consolidated results of WP6, highlighting the establishment of the CRAFT-IT4SD Learning Community, the implementation of the CRAFT-IT4SD Training Workshop program, the development of the Learning Ecosystems, the validation of the micro-credentials, and the creation of transferable educational resources that support knowledge transfer, skilling, upskilling and reskilling across the European fashion and related Cultural and Creative Sectors and Industries (CCSI).

The relationship between the tasks of WP6, their primary outputs, and the short-, medium-, and long-term impacts is illustrated in Figure 2. Within this main framework, the Training Workshops validated practices evaluated during the piloting phases in WP4, thereby enabling the transfer of innovations and skills across various topics (sustainability, digitalisation, material manipulation, creative mindset, etc.) and target groups.

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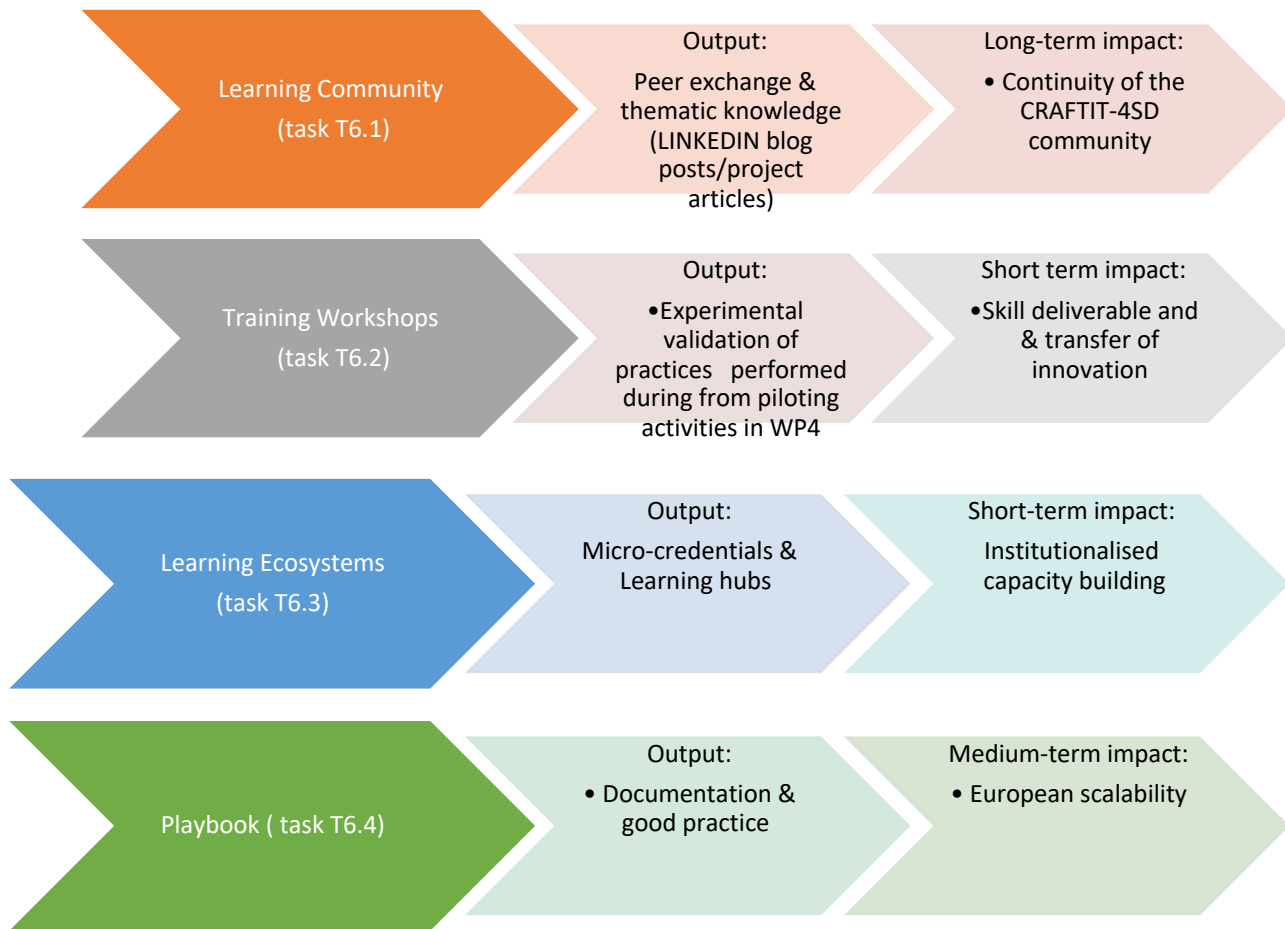


Figure 1.3: WP6 - Relationship among tasks, outputs and impacts on the learning ecosystem

The report, therefore, **moves beyond documenting activities to focus on transformation**. It converts project-based experimentation, resulting from piloting iterations, into a durable, replicable learning ecosystem that supports the green, digital, and social transition of the Cultural and Creative Sectors and Industries (CCSI).

Through a structured alignment of the training workshops with the piloting activities, the report demonstrates how experimentation, peer and collaborative learning, and the engagement of designers, researchers, experts, and company representatives form an interconnected ecosystem model capable of generating sustainable impact at local, regional, and European levels.

Ultimately, this document serves as both a sustainability roadmap and a strategic consolidation instrument, ensuring that the CRAFT-IT4SD Learning Ecosystem continues to evolve beyond the project lifecycle and contributes meaningfully to future-oriented skills development in the creative industries.

1.4. Partners

Ten partners acting as beneficiaries and one associate partner work together to implement the activities distributed over the four tasks.

Nº	Acronym	Partner	Country	Role
1	AU	AARHUS UNIVERSITET	DK	COO
2	VIA UC	VIA UNIVERSITY COLLEGE	DK	BEN
3	VTT	TEKNOLOGIAN TUTKIMUSKESKUS VTT OY	FI	BEN
4	3WALKS	ORTEGA NUERE MARIA CRISTINA	ES	BEN
5	FIC	FAINCE AB	SE	BEN
6	TUIASI	UNIVERSITATEA TEHNICA GHEORGHE ASACHI DIN IASI	RO	BEN
7	REGINNOVA NE	ASOCIATIA REGINNOVA NE	RO	BEN
8	OAMK	OULUN AMMATTIKORKEAKOULU OY - OULU UNIVERSITY OF APPLIED SCIENCES	FI	BEN
9	MODACC	AGRUPACIO CATALANA DEL TEXTIL I DE LA MODA	ES	BEN
10	ECBN	STICHTING EUROPEAN CREATIVE BUSINESS NETWORK	NL	BEN
11	EIT C&C	EIT CULTURE & CREATIVITY GMBH	DE	AP

2. CRAFT-IT4SD Learning Community across fashion and related CCSI (task 6.1)

The CRAFT-IT4SD project has launched a sustainable Learning Community at <https://www.linkedin.com/company/craft-it4sd/>, aimed at a diverse audience, including craftspeople, artists, designers, and prospective students. This community promotes lifelong learning through peer-to-peer exchanges, knowledge transfer, and collaborative pathways.

Four sections (groups) were created. The groups correspond to the four pilots in the partner countries and focus on the following main areas: *Innovative Business Models*, *Wardrobe for Sustainability*, *Empowering Consumers*, and *Crafts and Emerging Technologies*. Built on the principles of inclusivity and collaboration, the community is led by moderators and content creators who ensure active participation, share relevant resources, and facilitate networking. Each group developed online discussions, published thematic blog posts and case studies, and facilitated peer-to-peer learning via LinkedIn and a shared digital repository.

The CRAFT-IT4SD Learning Community was established as a collaborative platform for knowledge exchange, peer learning and capacity building across the Fashion industries, in particular the fashion sector and the Cultural and Creative Sectors and Industries (CCSI). Beyond its role as a LinkedIn-based communication space, it evolved into a structured knowledge-sharing platform that transformed pilot results, research findings and methodological developments into reusable knowledge resources.

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This section of the report is based on the analysis of the research insights and blog articles included in 36 publication titles. Together, these knowledge resources document practical experimentation, sustainable business models, digital fabrication, cultural heritage revitalisation, consumer engagement, future skills and learning ecosystem development. The key indicators achieved so far are summarised in Table 1.1

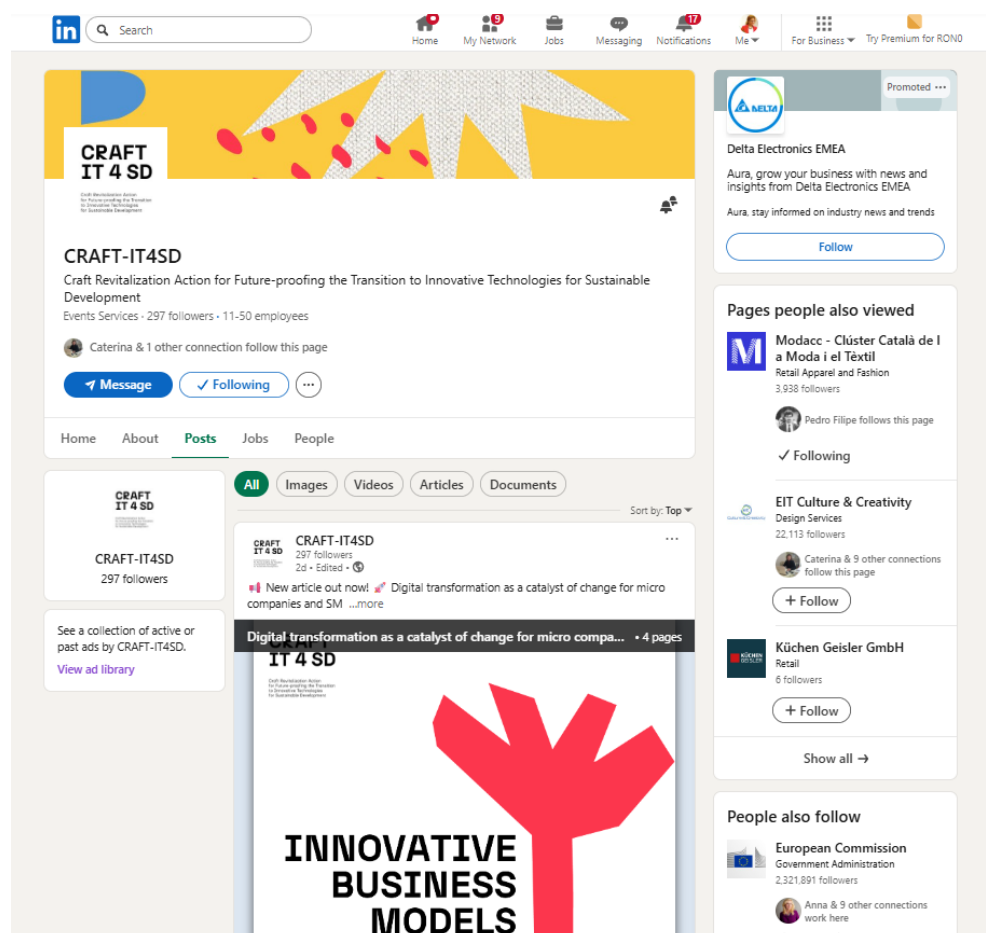


Figure 2.1. CRAFT-IT4SD LinkedIn page

Table 1.1 Key indicators achieved by the CRAFT-IT4SD Learning Community.

Indicator	Value	Indicator	Value
Learning Community platform	LinkedIn	Training workshops supported	16
Knowledge resource files inventoried	36	Pilot ecosystems documented	4
Unique publication titles identified	34	Pilot iterations documented	3
Learning Community groups	4	Contributing authors	30+
Cross-cutting theme	1	Main knowledge domains	6
Participating countries	6	Emerging professional profiles proposed	3
Consortium partners contributing	7		

The blog articles published through the CRAFT–IT4SD Learning Community on the LinkedIn page were not merely some report activities. They translated pilot experimentation into educational narratives, methodological reflections and sector-oriented guidance. This made the Learning Community a mechanism for knowledge transfer, skilling, upskilling and reskilling across multiple stakeholder groups.

The production of the training materials and knowledge resources followed the iterative logic of the project pilots. The first outputs focused on awareness, exploration and initial experimentation. The second phase deepened applied experimentation, regulatory literacy and material innovation. The latter resources increasingly addressed learning ecosystems, emerging professional identities, transferability and future competence pathways.

Table 2.1. Evolution of knowledge production across the project iterations

2024 Launch of the CRAFT-IT4SD Learning Community	2025 - Iteration 1/ Experimentation	2025 - Iteration 2/ Development	2026 – Iteration 3/ Consolidation
Learning Community launched and thematic groups activated.	Initial knowledge resources on awareness, experimentation and pilot exploration.	Resources on material experimentation, legislation, business models and digital tools.	Synthesis resources, skills pathways and Knowledge Observatory consolidation.

The knowledge flow within the CRAFT-IT4SD Learning Ecosystem (Figure 2.2) illustrates how pilot outcomes were transformed into knowledge resources, educational methodologies, and capacity-building activities that support skilling, upskilling, and reskilling.

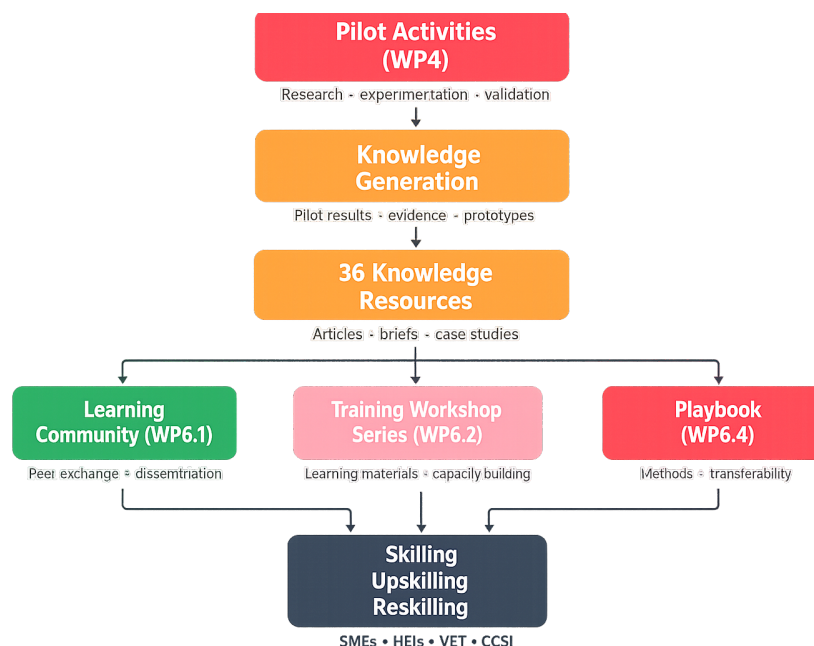


Figure 2.2. Knowledge flow within the CRAFT-IT4SD Learning Ecosystem.

Table 2.2 The knowledge resource files inventoried (see Table 1.1) in the Learning Community archive, distributed by the four active groups. In the consolidation phase (3rd iteration), the articles were cross-cutting, joining the learning development interests, results and outcomes among all or/and several partners

No.	Knowledge Resource	Lead / Partner	Theme	Keywords	Very short summary
1	The AI Rocket - A Professional Approach to Generative AI	VIA University College	Empowering Consumers	Digital design; AI; co-creation; validation	Presents the AI Rocket method as an iterative framework for using generative AI as a reflective and value-creating partner in design and business development.
2	Analysing the Climate Impacts of SME Fashion Business Models	VTT	Innovative Business Models	Climate impact; LCA; SME business models	Explains how climate impact assessment can help SMEs compare business model choices, avoid false assumptions and link innovation with measurable sustainability outcomes.
3	Future Development Aspirations and Alternatives in Sustainable Fashion Business Models	VTT	Innovative Business Models	Sufficiency; future business models; sustainability	Explores sufficiency-based fashion business models and the benefits, trade-offs and strategic choices involved in reducing consumption while creating value.
4	Brewing Creativity: Coffee's Role in Fashion and Textile Sustainability	OAMK	Wardrobe for Sustainability	Coffee waste; upcycling; circular materials	Shows how coffee packaging and coffee-related waste streams can inspire circular textile experimentation, performance costume design and material reuse.
5	Bridging the Skills Gap: Preparing Artists and Makers for a Sustainable, Inclusive and Digital Future	ECBN / 3Walks	Cross-cutting	Skills gap; inclusion; digital future; CCSI	Discusses the skills gap facing artists, makers and small creative businesses and identifies learning pathways for sustainable, inclusive and digital transitions.
6	Bright Ideas: Sustainable LED Tech for Fashion and Performance	OAMK	Crafts & Emerging Technologies	LED; wearable technology; performance	Explores accessible LED technologies, open-source tools and sustainable design practices for fashion, wearable tech and performance contexts.

7	On the Spotlight: The Role of Certification and Labelling in Sustainable Fashion	MODACC	Innovative Business Models	Certification; labelling; transparency	Clarifies why certification and labelling matter for sustainable fashion and how they can support transparency, credibility and informed decision-making.
8	Reviving Authentic Crafts with Additive Manufacturing	TUIASI	Crafts & Emerging Technologies	3D printing; craft; heritage; fashion	Explains how additive manufacturing can extend traditional craft expression by enabling intricate, low-waste and culturally meaningful fashion components.
9	Cultural Heritage as a Pathway to Developing Future Materials for Garments	VIA / OAMK	Wardrobe for Sustainability	Casein; fish skin; biomaterials; MDD	Documents trial-and-error experimentation with casein and fish skin, showing how cultural heritage can guide future biomaterial development.
10	Digital Carriers - Putting NFC into Action to Explore and Unlock Value Creation Potentials	VIA University College	Empowering Consumers	NFC; AIDC; value creation; traceability	Presents NFC as a digital carrier for product storytelling, transparency and customer engagement within craft and fashion value chains.
11	Digital Transformation as a Catalyst of Change for Micro Companies and SMEs	MODACC	Innovative Business Models	Digitalisation; SME resilience; triple transition	Explores how micro-companies and SMEs can turn digitalisation into an opportunity for competitiveness, innovation and responsible transformation.
12	Empowering the Future: Up- and Re-skilling in Emerging Crafts and Creative Professions for the Triple Transition	ECBN / 3Walks	Cross-cutting	Upskilling; reskilling; triple transition	Frames upskilling and reskilling as core mechanisms for preparing creative professionals for green, digital and social transition pathways.
13	Enabling Sufficiency-Based Consumption in Fashion	VTT	Innovative Business Models	Sufficiency; consumption; business models	Analyses how fashion businesses can support sufficiency-oriented consumption and reduce demand-side environmental impacts.
14	The Market Environment of Sustainable Fashion Business Models	VTT	Innovative Business Models	Market environment; sustainable business; fashion	Examines the market conditions shaping sustainable fashion business models, including customer expectations, competitiveness and barriers to adoption.

15	From Fish Leather to Capsule Closets: The Future of Fashion in a Warming World	OAMK	Wardrobe for Sustainability	Fish leather; capsule wardrobe; slow fashion	Connects fish leather, capsule wardrobes and responsible consumption as practical pathways for adapting fashion to climate and resource pressures.
16	From Compliance to Integration: Value Creation through Legislation Adoption	MODACC	Innovative Business Models	Legislation; value creation; compliance	Shows how legislation can be treated not only as a compliance burden but as a driver for value creation, innovation and strategic transformation.
17	The CRAFT-IT4SD Ecosystem: From Experimental Learning to Structured Skills Creation	TUIASI / Aarhus University	Cross-cutting	Learning ecosystem; skills; workshops	Explains how experimental learning, training workshops and pilot activities evolved into a structured ecosystem for skills creation.
18	From Tradition to Innovation by Integrating 3D Printing and Sustainable Craft Development	REGINNOVA	Crafts & Emerging Technologies	3D printing; SME innovation; craft	Presents additive manufacturing as a tool for regional craft innovation, SME engagement and sustainable product experimentation.
19	Future-proofing Creativity: Developing Green, Social and Digital Competencies	ECBN / 3Walks	Cross-cutting	Green skills; digital skills; social skills	Identifies competence needs for the next generation of crafts and creative industries, linking regenerative thinking, digital fluency and social engagement.
20	Gamification in Learning: Turning Work into Play	OAMK	Wardrobe for Sustainability	Gamification; learning; fish leather	Shows how game-based learning can make sustainability and craft learning more engaging, using fish leather tanning as an educational example.
21	How Receptive Are Craftspeople and Designers to Adopting Digital Innovation for Sustainability?	TUIASI	Crafts & Emerging Technologies	Focus groups; digital innovation; sustainability	Reports stakeholder perceptions of digital tools and sustainability, highlighting opportunities and barriers to adoption among designers and craftspeople.
22	Fashion Industry under the Legislative Loop	MODACC	Innovative Business Models	ESPR; DPP; EPR; CSRD	Provides an accessible overview of EU sustainability regulations affecting fashion companies and their implications for SMEs.

23	Let's Focus on the Slow Fashion Movement: Embracing the 5Rs of Sustainability	OAMK	Wardrobe for Sustainability	Slow fashion; 5Rs; consumption	Introduces the 5Rs of sustainability and encourages slow fashion practices based on refusal, reduction, reuse, repurposing and recycling.
24	New Business Models and Pathways for Sustainable Fashion in the Digital Era	VTT	Innovative Business Models	Digitalisation; circular business; risks	Explores opportunities and risks of digital tools for sustainable fashion, including efficiency, repair, virtual prototyping and potential rebound effects.
25	Optimizing Your Sustainable Business Model by Using Data Analytics: A Short Guide for SMEs	MODACC	Innovative Business Models	Data analytics; demand prediction; SME tools	Offers a practical SME-oriented guide to using data for resource optimisation, emissions tracking and sustainability-oriented decisions.
26	Participatory Methodologies: How CRAFT-IT4SD Built a Collective Approach for Researching Sustainable Transitions	VIA / Consortium	Cross-cutting	Participatory methods; playbook; co-design	Explains how methodological diversity and participatory practices were coordinated across pilots to generate transferable knowledge for sustainable transitions.
27	Reimagining Cultural Heritage through Sustainable Approaches Using 3D Printing Technologies	TUIASI	Crafts & Emerging Technologies	Easter Egg collection; 3D printing; heritage	Documents how Romanian Easter Egg motifs were reinterpreted through 3D printing and sustainable fashion design as a contemporary heritage tribute.
28	Tales from the Backstage of Craft Making: Surfacing Invisible Work for Textile Craft Innovation	VIA University College	Crafts & Emerging Technologies	Craft labs; invisible work; innovation	Highlights calibration, repair, waiting, coordination and cleaning as invisible but essential forms of work enabling textile craft innovation.
29	The AI Rocket - A Professional Approach to Generative AI (duplicate PDF file)	VIA University College	Empowering Consumers	AI; design education; validation	Duplicate file version of the AI Rocket knowledge resource; retained in the file inventory to reflect the 36 PDFs provided in the archive.
30	The CRAFT-IT4SD Ecosystem: From Experimental Learning to Structured Skills Creation	TUIASI / Aarhus University	Cross-cutting	Learning ecosystem; skills; micro-credentials	A second PDF version of the ecosystem resource, documenting the transition from experimental learning towards structured skills creation.

31	The Role of Green, Social and Digital Skills in Transforming the Creative and Cultural Sectors	ECBN / 3Walks	Cross-cutting	Green skills; social skills; digital skills	Discusses how green, social and digital skills are becoming fundamental to value creation and the future culture of making in CCSI.
32	The Thing from the Future: Craft, Culture and Digital Technologies	VIA University College	Empowering Consumers	Futures thinking; scenario design; craft	Uses a futures imagination game to stimulate speculative thinking around craft, heritage, culture and digital technologies.
33	Cultural Heritage as a Pathway to Developing Future Materials for Garments - Trial-and-Error in Material Experimentations (duplicate PDF file)	VIA / OAMK	Wardrobe for Sustainability	Casein; fish skin; experimentation	Duplicate file version of the material experimentation resource; retained in the file inventory to reflect the full archive.
34	Triple Transition in the Creative Economy: How Up- and Re-skilling Is Shaping Emerging Professions	ECBN / 3Walks	Cross-cutting	Emerging occupations; reskilling; maker of future	Introduces emerging hybrid professional profiles shaped by sustainability, digital literacy and social engagement in craft and fashion.
35	Where Heritage Meets Innovation: CRAFT-IT4SD Pilots Crafting a Circular and Sustainable Future	ALL partners	Cross-cutting	Pilot synthesis; heritage; circularity	Synthesises the second pilot iteration across Finland, Denmark, Romania and Catalonia, showing how heritage, digital tools and circular economy principles converge.
36	Can We Train Future Artisans to Bring Sustainable Solutions to Creative Communities?	TUIASI	Crafts & Emerging Technologies	Future artisans; education; heritage; 3D printing	Argues that future artisans can be trained to combine cultural heritage, additive manufacturing and sustainable thinking in creative communities.

The distribution in Figure 2.3 shows that the CRAFT-IT4SD Learning Community generated substantial content across all thematic groups. *Innovative Business Models* is strongly represented because several resources addressed legislation, digitalisation, sufficiency-based models, climate impacts and SME decision-making. *Crafts & Emerging Technologies* and the *cross-cutting* stream are also prominent, reflecting the project's strong focus on heritage revitalisation, future skills and digital craft innovation.

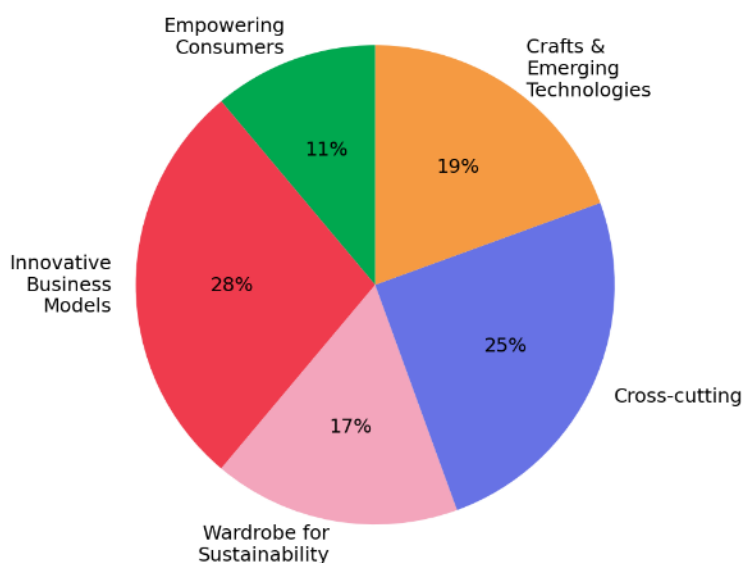


Figure 2.3. Distribution of the knowledge resource files by Learning Community theme.

Table 2.3. Knowledge production by Learning Community theme.

Learning Community Theme	No. of resources	Main knowledge contribution
Innovative Business Models	10	Regulation, data analytics, climate assessment, sufficiency-based business models and SME competitiveness.
Wardrobe for Sustainability	6	Slow fashion, fish leather, casein, coffee waste, circular wardrobes and material experimentation.
Empowering Consumers	4	NFC, AI-supported design, futures thinking, value creation and product-storytelling tools.
Crafts & Emerging Technologies	7	3D printing, additive manufacturing, LED wearables, digital fabrication and invisible work in craft labs.
Cross-cutting	9	Learning ecosystems, participatory methodologies, future skills, emerging occupations and pilot synthesis.

The six knowledge domains covered by the CRAFT-IT4SD Learning Community are closely interconnected (Figure 2.4). **Sustainability** is addressed through circular economy, sufficiency, slow fashion and alternative materials. **Digital transformation** is evident in AI, NFC, digitalisation, LED wearables, and 3D printing. **Cultural heritage** is treated as a resource for innovation, while **business innovation** and **skills development** translate these insights into practical learning pathways. The **learning ecosystem** domain connects all resources to peer learning, training workshops and future micro-credential development.

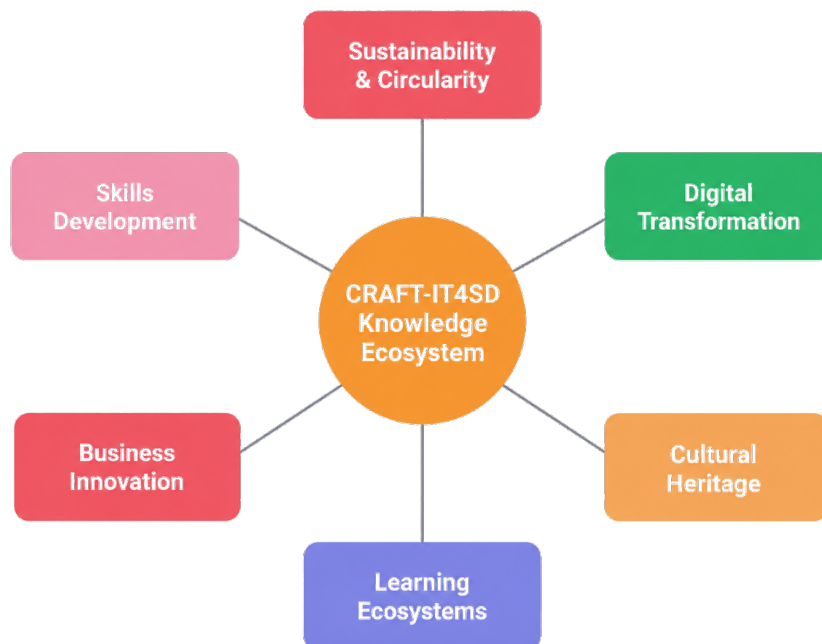


Figure 2.4. Interconnected knowledge domains covered by the Learning Community.

The CRAFT-IT4SD Learning Community evolved from a communication or dissemination channel into a structured knowledge ecosystem. The resources collectively show how research, experimentation, and pilot actions were transformed into transferable educational resources that support knowledge transfer, peer learning, and competence development. Moreover, the collected resources strengthened the training workshop program (in T6.2), enriched the learning ecosystem, and supported the development of future micro-credentials and lifelong learning pathways (in T6.3). They also provide an evidence base for exploitation beyond the project by making the knowledge accessible to SMEs, higher education institutions, VET providers, designers, craftspeople, researchers and policy stakeholders.

Overall, the CRAFT-IT4SD Learning Community demonstrated its capacity to generate long-term value for the European TCLF industries, fashion and CCSI. They document a transition from isolated pilot experiences to an integrated European learning model for the green, digital and social transition.

3. Exchanging good practices and peer learning for creative industries – Training Workshops (task 6.2)

3.1. Introduction

This section (Chapter 3) outlines the activities undertaken by the entire consortium in **WP6—Skills and learning communities across fashion and related CCSI** — within the framework of **Task T6.2: Training Workshops**. The training workshops conducted during and at the end of all three pilot iterations in WP4 relied on good practices and facilitated peer learning. During the reporting period, 15 training workshops were conducted in Romania, Spain, Finland, Sweden, and Denmark, corresponding to the WP4 pilots in those countries and also dedicated to WP5. Moreover, to add an international hint, in September 2025, during the Creative Skills Week in Prague, the 6th training workshop of the first iteration was delivered as a panel contribution to the EIT CC-led panel, The Future of Craft: From Tradition to Innovation, to achieve international impact.

Building on the knowledge, methodologies and innovations generated through the pilot activities, CRAFT-IT4SD developed a CRAFT IT-4SD Training Workshop program as a structured and iterative learning programme. Following the same three-iteration approach adopted in the pilots, the workshops progressively transformed research outcomes, experimental practices, and pilot experiences into transferable learning resources that support knowledge transfer, skilling, upskilling, and reskilling across the Fashion sector and the Cultural and Creative Sectors and Industries (CCSI).

Rather than functioning as fifteen independent training events, the workshops were intentionally designed as an integrated educational pathway. Each iteration built upon the achievements of the previous one, moving from awareness-raising and exploration through experimentation and co-creation to the integration, validation, and transfer of innovative practices into education and professional development. This iterative approach enabled the consortium to progressively refine the training methodology while responding to the evolving competence needs identified during the pilot activities.

The Training Workshop Series engaged SMEs, researchers, higher education institutions, students, craftspeople, designers, creative professionals, managers and entrepreneurs in collaborative learning environments combining expert knowledge, peer learning, challenge-based activities and hands-on experimentation. Delivered in face-to-face, online and hybrid formats, the workshops addressed sustainability, circular economy, digital technologies, cultural heritage, entrepreneurship and innovative design practices. Together, they established a transferable training model that supports the CRAFT-IT4SD Learning Community by facilitating continuous knowledge exchange, competence development and lifelong learning for the green, digital and social transition.

The workshops organised across Spain, Sweden, Finland, Denmark, and Romania, as well as at the international level, provided important insights into the educational needs related to the sustainability transition in the fashion and related Cultural and Creative Sectors and Industries (CCSI).

The **first iteration of training workshops** highlighted several key aspects of sustainability education. Participants emphasised the importance of **practice-based learning approaches**, including hands-on experimentation with digital technologies and services such as NFC tags and systems, digital product passports, gamification tools, and additive manufacturing. The workshops also demonstrated the value of **interdisciplinary learning**, bringing together perspectives from design, engineering, business, and cultural heritage. In addition, the activities demonstrated that creativity, storytelling, and user engagement play important roles in sustainability education, as

technical knowledge alone is often insufficient to influence behaviour. The workshops encouraged participants to reflect critically on sustainability challenges and to engage more deeply with sustainable practices in the fashion sector. At the same time, **policy awareness and regulatory literacy** were identified as essential knowledge areas, particularly regarding EU sustainability frameworks and regulations that affect the fashion industry's business models.

The **second iteration of training workshops** confirmed these findings and further highlighted several cross-cutting priorities for the development of future learning materials. These include strengthening knowledge of **environmental regulation, climate impact assessment, and emerging professional roles in the fashion sector**. The workshops also emphasised the importance of **accessible digital tools and interactive media** for communicating sustainability concepts and engaging different audiences. Finally, the training activities reinforced the relevance of **experiential and practice-based learning approaches**, including experimentation with materials, digital fabrication technologies, and design processes, which support critical thinking and creative exploration.

The **third iteration of the CRAFT-IT4SD training workshop** marked the culmination of the European learning journey, demonstrating the integration of sustainability, digital technologies, craftsmanship, and entrepreneurship into interdisciplinary innovation processes. Building on the knowledge and competencies developed during previous iterations, the workshops adopted human-centred and challenge-based learning approaches, enabling participants to combine creative design, emerging technologies, and cultural heritage to address real-world sustainability challenges.

The entire training workshop program confirmed the maturity and transferability of the CRAFT-IT4SD educational methodology, providing a replicable model for competence development across higher education, vocational training and lifelong learning in the Fashion sector and the wider CCSI.

3.2. Overview of the training workshops

An overview of the **1st iteration of the training workshops** is presented below, including impact and recommendations:

Organising Partners and Country	Title	Number of participants and Target groups.	Recommendations for Learning Materials
MODACC ES-Spain	Activation workshop Objectives: Empower participants to drive and align their company with a systemic vision that integrates sustainability, circularity, and impact measurement, enabling them to lead change	Number of participants: 25 representatives of micro-companies and SMEs	This workshop highlighted the following recommendations: Identify key sustainability and circularity challenges and transform them into business opportunities; Develop actionable strategies to implement sustainable and circular solutions throughout the fashion value chain; and strengthen leadership skills by creating decision-making scenarios.

	effectively and strategically.		
FIC SE - Sweden	Collaboration/Co-Creation Workshop Objectives: Understand the legal requirements of the European Union's Digital Product Passport and beyond. Create a digital layer and explore new opportunities and user-based experiences for fashion brands and businesses.	Number of participants: 25 • SMEs representatives • business leaders • fashion designers, • students currently enrolled in fashion programmes • entrepreneurs	There are two pillars on which this workshop was based: policy and the OCA Platform. Policy topics are subject to change over time; therefore, they need to be updated before each run to reflect new policy developments on the status of sustainability and competitiveness policies for the fashion industry. Over time, the EU's compliance requirements for DPP and other reporting directives, including CSRD and CSDDD, also evolve. Educators must be familiar with the OCA Platform with NFC tags to utilise them within this workshop.
OAMK FI-Finland	Using Gamification in Garments to Enhance Awareness and Skills Objectives: To teach local CCSI how they could use gamification on their products to teach consumers new skills or enhance awareness on a certain topic.	Number of participants: 13 • students • unemployed individuals • researcher and university staff • representatives from design labs and innovation centres across Europe	Participants examined existing games to understand design structures and evaluated tools for creating accessible, educational games. The participants also developed ideas for educational games. The workshop format is well-suited for inclusion in micro-courses on sustainable design, digital storytelling, and gamification. Future iterations could include more hands-on game development and co-creation with students and artisans. The following learning achievements were noted: A simplified game editor template for students to create their own craft-based games; Interactive tutorials on NFC tag integration; Case-based learning modules using the From Fish to Wonder game as an example
VIA DK-Denmark	Automatic Identification and Data Capture (AIDC) for companies Objectives: The workshop introduced NFC (Near Field Communication) as an accessible AIDC	Number of participants: 16 • students • lecturers / academic staff	This workshop shows strong potential as a recurring or modular component in interdisciplinary design and business education. Future iterations should allow for more time, deeper experimentation, and individual exploration between sessions. Follow-up workshops could include prototyping NFC-enabled products, integrating with storytelling or service

	(Automatic Identification and Data Capture) technology to students in design and business. Participants experimented hands-on with NFC tags using their own smartphones and explored how AIDC can create value in design, branding, and retail. Conceptual input was paired with playful exploration, case work, and group reflection.		design, and exploring back-end infrastructure (databases, APIs, etc.).
TUIASI & REGINNOVA RO-Romania	Additive Manufacturing and 3D Printing on Flexible Materials Objectives: Using additive technologies, the on-site workshop explored 3D printing on textiles to translate traditional symbols into contemporary creations, revitalising crafts through a modern, innovative visual language. It enabled hands-on experimentation with materials and techniques, encouraging creativity and a dialogue between tradition and innovation.	Number of participants: 33 - students from BSc Industrial Engineering, - students from BSc Engineering and Management, - students from BSc Industrial Design.	The workshop demonstrated strong potential as a multidisciplinary learning module that bridges engineering, design, and cultural studies. It is recommended to integrate this format into curricula focused on sustainable design, digital fabrication, and heritage innovation. Future iterations could include more advanced modelling techniques, collaborations with artisans, and real-life product development challenges. The approach encourages experiential learning, critical thinking, and creative engagement with both tradition and technology.

An overview of the **2nd iteration of the Training Workshops** is presented below, including impact and recommendations:

Organising partner & country	Training workshop title and objective	Target group & number of participants	Recommendations for future learning materials
MODACC ES-Spain	New professional Profiles Arising from the New	Number of participants: 60	Framing correctly the relevance of transforming the value chain to achieve sustainability goals.

	Environmental Regulatory Framework Objectives: to share information about new occupations driven by changes in environmental legislation in the textile and fashion sector, supporting the dynamization and regeneration of the Catalan fashion industry.	Multiple stakeholder groups from the Catalan textile and fashion ecosystem, including: • fashion brands (SMEs) • manufacturers • governance entities • consulting firms • large enterprises • designers • students	• Gather from reliable sources information about employment data in the Textile and Fashion Sector • Properly develop a set of future employment scenarios for the sector under evaluation. • Identify and describe the new professional profiles for future scenarios • Recommendations and guidelines for integrating new profiles and capacity-building needs.
VTT SE-Sweden/ International	Measuring Climate Impact in Fashion Objective: A webinar to train fashion practitioners on how to measure climate impacts in the fashion sector and how selected circular fashion business models can cut climate impacts	Number of participants: 23 practitioners from over 10 European countries 4 facilitators • fashion practitioners, • representatives of different types of fashion sector organisations	The workshop concept exemplified in practice: • how to have an interactive training component (a quiz) in a webinar to make the event more engaging • how to summarise the study method so that a non-LCA-expert understands the method (a short life cycle assessment (LCA) methodology training included) • how to present the results of LCA case studies on selected circular fashion business models in a manner that the non-LCA expert audience understands the climate benefits of these models.
OAMK FI-Finland	Introduction to TouchDesigner Objectives: To explore and consider TouchDesigner as an accessible, no-cost or low-cost tool for interactive media production, storytelling, data visualisation, and	Number of participants: 12 • staff of CRAFT-IT4SD consortium • researchers • university staff, • representatives from design labs and innovation centers across Europe	Participants identified potential SME-relevant applications of TouchDesigner, particularly in sustainability communication, product transparency, and interactive customer experiences. Ideas included visualising textile waste and CO ₂ footprints, creating real-time product-journey displays, integrating digital layers into fashion items, and using customer data or sensor data to enhance engagement. The brainstorming demonstrated a strong interest in applying interactive media to support green transition communication and value creation in SMEs in the creative and cultural sector.

	audience engagement for SMEs.		
VIA DK-Denmark	Material-Driven Design for Apparel and Textiles Objective: To explore the process tool Material Driven Design, which was further developed and tested in the second pilot iteration, and to refine it as an educational tool.	Climathon event: Students from VIA Design and Business and Business Academy Midwest Number of participants: • 78 students from four BA programs, VIA Design & Business • 50 students from four programs, Business Academy Midwest Design education: Fashion students from two classes (a national and an international group) Number of participants: • 23 International BA Fashion Students • 18 Danish Fashion Students	The workshops showed that it is very important with a clear presentation, as the model is highly complex. The workshops were executed over several months, which gave us the opportunity to further develop the presentation and the handouts. The workshops promoted sustainability, taking the material perspective into the fuzzy front end of the design process. The approach encourages experiential learning, critical thinking, and creative engagement with materials and how to process them in a design process.
TUIASI & REGINNOVA RO-Romania	Additive Manufacturing and 3D Printing on Flexible Materials Objectives: To explore 3D printing on textiles to translate traditional symbols into contemporary designs; To enable hands-on experimentation with materials and techniques, encouraging creativity and a dialogue between tradition and innovation.	Number of participants: 23 • students from BSc Industrial Engineering, • students from BSc Engineering and Management, • students from BSc Industrial Design. • designers • researchers and academic staff	The workshop demonstrates strong potential as a multidisciplinary learning module that bridges engineering, textile design, and crafts. This format can be integrated into curricula focused on sustainable design, digital fabrication, and technological innovation. The workshop promoted sustainability by using biodegradable or recyclable 3D printing materials (PLA). Textile substrates were sourced from fabric scraps and upcycled garments to reduce waste. Future iterations could include more advanced modelling techniques, collaborations with artisans, and real-life product development challenges. The approach encourages experiential learning, critical thinking, and creative engagement with both tradition and technology.

ECBN /3Walks	The Future of Craft: From Tradition to Innovation. Objective: To address the future and innovation potentials of the European craft sector -Panellists and audience explore the challenges and opportunities facing the European craft sector	Number of participants 6 panelists 30 participants Panellists: Creative Futures Academy European Craft Alliance CRAFT-IT4SD CRAFTWORK 4.0 CUBE Moderation: EIT CC	Craft, a sector rich in diversity and deeply linked to heritage, region, culture, and tradition, is undergoing significant changes influenced by economic trends, technological innovation, and shifting market preferences. There is a significant resurgence of interest in handmade, artisanal products, partly driven by an appreciation for traditional craftsmanship, authenticity, making spaces, slow movement, and sustainability. This resurgence is evidenced by the estimated size and value of the European market for crafts and makers. However, challenges such as skill gaps, inadequate training, and a lack of entrepreneurial skills persist. Education and training are key factors to guarantee the future of crafts and creative makers.
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An overview of the **3rd iteration of the Training Workshops** is presented below, including impact and recommendations:

Organising partner & country	Training workshop title and objective	Target group & number of participants	Recommendations for future learning materials
MODACC (Spain)	Design Thinking for Sustainable Fashion Innovation Objective: To introduce Design Thinking as a human-centred methodology for developing sustainable products, services and business solutions within the fashion sector.	SMEs, designers, students, researchers, entrepreneurs and innovation stakeholders. Number of participants: 25	Develop learning modules on Design Thinking for sustainability, including empathy mapping, ideation, rapid prototyping and collaborative problem-solving. Include practical case studies that link sustainability challenges to circular innovation and entrepreneurship.
VIA University College (Denmark)	Empathic Design and Sufficiency Business Models Objective: To explore user-centred design methods and sufficiency-oriented business models that promote sustainable	Design students, researchers and educators. Number of participants: 16	Develop educational resources that integrate empathic design, user research, sufficiency principles, and circular business innovation. Include collaborative exercises connecting product design with sustainable consumption patterns.

Organising partner & country	Training workshop title and objective	Target group & number of participants	Recommendations for future learning materials
	consumption and responsible production.		
OAMK (Finland)	Performance Costume Design through Printed Electronics Objective: To investigate how printed electronics and wearable technologies can enhance creative expression while supporting sustainable design and interdisciplinary collaboration.	Designers, students, researchers and creative professionals. Number of participants: 13	Create hands-on learning modules on wearable technologies, printed electronics and creative prototyping. Learning materials should combine digital fabrication, sustainability and artistic experimentation within interdisciplinary design projects.
VTT/FIC (Finland/Sweden)	Sufficiency Business Models for Fashion SMEs Objective: To explore innovative business models that reduce environmental impacts while creating long-term value for fashion SMEs and consumers.	SMEs, fashion practitioners, sustainability experts and researchers. Number of participants: 25	Develop case-based learning materials that illustrate sufficiency strategies, circular business models, and climate-conscious entrepreneurship. Include practical tools supporting business transformation and sustainability decision-making.
TUIASI & REGINNOVA (Romania)	Designing and Producing a Sustainable Capsule Collection Using 3D Printing Objective: To integrate Design Thinking, cultural heritage, additive manufacturing and sustainable fashion design through collaborative development of a capsule collection.	Students, researchers, designers, craftspeople and SMEs. Number of participants: 33	Develop interdisciplinary learning modules that combine Design Thinking, additive manufacturing, digital fashion, cultural heritage, material experimentation, and sustainable product development. Include project-based activities that encourage collaboration among design, engineering, and creative disciplines.

Overall, the quantitative indicators achieved in these 3 iterations of the training workshops are summarised in the infographic below (Figure 3.1).



Figure 3.1. CRAFT-IT4SD training workshops: Overview of the participants. Target and impact quantitative indicators. AI-generated image with Gamma.app

3.3. Learning insights of the training workshops

3.3.1. First iteration of the training workshops

The workshops conducted across Spain, Sweden, Finland, Denmark, and Romania, as well as at the international level, provided valuable insights into the educational needs arising from the sustainability transition in the fashion and related CCSI sectors. Together, these findings suggest that learning materials should integrate technical skills, sustainability awareness, and creative experimentation within flexible, modular educational formats, such as micro-courses/micro-credentials and interdisciplinary learning models.

After the 1st iteration, the CRAFT-IT4SD Learning Community revealed the following **insights**:

- There is a strong emphasis on practice-based learning approaches, including hands-on experimentation with digital technologies such as **NFC, digital product passports, gamification tools, and additive manufacturing**.
- The workshops highlight the importance of **interdisciplinary learning** that connects design, engineering, business, and cultural heritage perspectives.
- The various training activities demonstrated how **creativity, storytelling, and user engagement** contribute to sustainability education. Technical knowledge alone is often insufficient; therefore, learning materials should incorporate **creative approaches such as narrative design, gamification, and interactive activities**.
- The training workshops demonstrated how the **critical reflection** of the participants and their **deeper engagement with sustainable practices**, particularly within the fashion and creative sectors, strongly influence perceptions and consumption behaviour.
- Policy awareness and regulatory literacy emerge as **critical knowledge** areas for learners and professionals in the fashion and related CCSI, including students, designers at the beginning of their careers, representatives of micro, medium and small companies and even brands and large enterprises. It applies in particular to EU **sustainability frameworks** and related directives.

3.3.2. Second iteration of the training workshops

The 2nd iteration of training workshops reinforced the findings from the 1st iteration and highlighted three major **cross-cutting insights** for the development of future learning materials. First of all, there is a strong **need to support sustainability transitions** through improved understanding of environmental regulation, climate impact assessment, and emerging professional roles in the fashion sector. Secondly, the training workshops emphasise the importance of accessible **digital tools and interactive media** for communicating sustainability concepts and engaging audiences. Last but not least, the **experiential and practice-based learning approach** completed the 1st iteration by including hands-on experimentation with materials, digital fabrication technologies, and design processes, which proved particularly effective in fostering critical thinking and creative exploration.

Despite addressing diverse themes—including **sustainability regulation, digital product passports, climate impact measurement, gamification, interactive media, material-driven design, and digital fabrication**—the workshops reveal several shared priorities for developing future learning materials within the CRAFT-IT4SD project. The workshops emphasised the growing importance of **sustainability-related competencies**, particularly in response to evolving European regulatory frameworks. Topics such as the Digital Product Passport, climate impact assessment, circular fashion business models, and environmental reporting requirements are becoming increasingly relevant for professionals in the fashion ecosystem. Learning materials should therefore support regulatory literacy and

sustainability-oriented decision-making, enabling learners to understand both policy developments and their practical implications for the industry.

All workshops highlighted the role of **digital technologies and tools** in enabling new forms of sustainability communication, transparency, and product interaction. Technologies such as NFC, interactive media platforms, data visualisation tools, and digital fabrication techniques demonstrated strong potential for educational purposes, enabling learners to experiment with new ways to connect sustainability data, storytelling, and product experiences.

The workshops consistently demonstrated the **value of experiential and practice-based learning approaches**. Hands-on experimentation with materials, technologies, and design methods proved particularly effective in supporting deeper understanding and critical reflection. Activities such as prototyping, game development, digital storytelling, and interactive design exercises allow learners to translate theoretical knowledge into practical skills.

Finally, the workshops underline the importance of **interdisciplinary learning environments** that connect design, engineering, business, and cultural heritage perspectives. Sustainability challenges in the fashion sector require collaboration across multiple domains, and educational programmes should therefore reflect this complexity by integrating diverse disciplinary approaches.

3.3.3. Third iteration of the training workshops

The 3rd iteration of the training workshop program marked the consolidation of the CRAFT-IT4SD learning journey by demonstrating how sustainability, digital technologies, craftsmanship and entrepreneurship can be integrated into coherent innovation processes. Building on the foundations established in previous iterations, the workshops shifted from exploring individual topics to applying interdisciplinary approaches to address complex real-world challenge

Three major cross-cutting insights emerged. First, the workshops confirmed the importance of integrating green, digital and creative competences through human-centred and challenge-based learning methodologies such as Design Thinking, co-creation and interdisciplinary collaboration. Secondly, participants demonstrated an increased ability to combine traditional craft knowledge with emerging technologies, including additive manufacturing, digital design and AI-supported creative processes, highlighting the value of hybrid competences for future professionals. Finally, the workshops showed that collaboration between universities, SMEs, designers, craftspeople and researchers creates effective learning ecosystems that facilitate knowledge exchange, innovation and skills development.

Overall, the third iteration demonstrated the maturity of the CRAFT-IT4SD educational approach, transforming individual training activities into a transferable learning model that supports competence development for the green, digital, and social transition of the fashion and the Cultural and Creative Sectors and Industries.

3.4. CRAFT IT4SD good practice: An iterative learning journey through training workshops

The CRAFT-IT4SD training workshops were designed as a structured, interconnected learning programme, adapted to the existing partners' ecosystems. The general goal of the training workshops was to support the green, digital, and social transition of the fashion and Cultural and Creative Sectors and Industries (CCSI). Rather than organising isolated training events, the consortium developed an iterative educational pathway in which each training

workshop contributed to the progressive development of knowledge, practical skills and future-oriented competences.

Implemented under Task 6.2, the workshop-based learning program brought together higher education institutions, research organisations, SMEs, designers, craftspeople, students, and technology and innovation providers in collaborative learning environments. The workshops combined theoretical knowledge, practical experimentation and peer-to-peer learning while addressing real sustainability and innovation challenges identified within the project pilots.

Across the three pilot iterations, the consortium progressively refined its pedagogical methodology, validated new learning approaches and strengthened the integration of sustainability, digitalisation, entrepreneurship and cultural heritage into creative education. The result is a coherent European learning journey that demonstrates how interdisciplinary training can support competence development for the future creative economy.

3.5. Training methodology adopted by the CRAFT-IT4SD consortium

Rather than repeating similar activities, each pilot iteration addressed a different stage of the learning process. Together, all the training workshops formed a progressive educational pathway, moving from awareness and exploration towards collaborative innovation and the development of transferable competence.

Table 3.4. CRAFT-IT4SD training workshops: Objectives, topics and educational outcomes

Iteration	Year	Objective	Description	Key topics	Educational outcomes
First Iteration	2025	✓ Awareness ✓ Inspiration ✓ Exploration	Established the foundations of the CRAFT-IT4SD learning programme by introducing participants to the major sustainability, digitalisation and circular economy challenges affecting the fashion ecosystem and the wider Cultural and Creative Sectors and Industries (CCSI).	Sustainability awareness; circular economy principles; digital technologies for fashion and crafts; emerging European legislation; Digital Product Passports; gamification; additive manufacturing; automatic identification technologies (AIDC); interdisciplinary collaboration.	Developed a common understanding of the challenges and opportunities associated with the green, digital and social transition, while stimulating curiosity, systems thinking and the initial exploration of innovative solutions.
Second Iteration	2025	✓ Experimentation ✓ Co-creation ✓ Developing new competences	Built upon the foundations established during the first iteration	material-driven design; printed electronics; climate impact	Strengthened technical, creative and collaborative competences

			by promoting collaborative experimentation, interdisciplinary teamwork and applied innovation through real-life design and sustainability challenges.	assessment; life cycle thinking; emerging professional profiles; heritage-based innovation; advanced additive manufacturing; circular business opportunities	through applied research, material experimentation, design thinking and interdisciplinary problem-solving, enabling participants to transform knowledge into practical solutions.
Third Iteration	2026	✓ Integration ✓ Innovation ✓ Consolidation of the learning ecosystem	Represented the most advanced stage of the learning journey, integrating previously acquired knowledge and competences into comprehensive innovation processes that connected sustainability, digital technologies, craftsmanship and entrepreneurship.	Design Thinking; empathic design; circular fashion; sustainable business models; additive manufacturing; performance costume design; sustainable capsule collection development; entrepreneurial thinking	Consolidated interdisciplinary competences by demonstrating how sustainability, craftsmanship, digital technologies and innovation can be integrated into coherent creative processes and transferable educational models supporting the sustainability of the CRAFT-IT4SD Learning Ecosystem.

One of the most significant achievements of Task 6.2 was the transformation of fifteen individual training workshops into a **coherent European good practice in learning**. The progressive iterations from awareness raising, through experimentation and co-creation, to integrated innovation demonstrate how iterative educational design can support the development of future-oriented competences for the green, digital and social transition.

Another achievement is testing the pedagogical methodology of an integrated model for a multinational workshop training program. Although each partner addressed different thematic areas according to its local, regional, or national expertise, all training workshops were designed around a shared pedagogical methodology developed collaboratively by the consortium. The common methodology combines interdisciplinary collaboration among designers, engineers, researchers, SMEs, and craftspeople with experiential learning through practical experimentation. Peer-to-peer learning and collaborative knowledge exchange have enhanced knowledge transfer and skills development by incorporating current research, policies, and industry practices.



Figure 3.2. CRAFT-IT4SD training workshops: Objectives, topics and educational outcomes. AI-generated image with Gamma.app

To facilitate comparison, replication and future reuse, every training workshop was documented using the same educational framework. A common reporting template was agreed by partners, and in annexes 1-15, all 15 workshops are described using the following components: Description/Overview; Experiments/Investigations conducted; Craft techniques applied; Technologies applied; Business models tested; Sustainability measures applied; Target and stakeholder groups; Learning outcomes, insights & good practices; Endorsements for learning materials and resources; Transferability for educational purposes.

Although each training workshop addressed different thematic priorities, all contributed to the development of the CRAFT-IT4SD Learning Ecosystem. Rather than functioning as isolated educational activities, the workshops became interconnected learning experiences that supported continuous competence development across the three pilot iterations.

The CRAFT-IT4SD training workshop program, therefore, represents more than a set of educational events. It constitutes a transferable pedagogical model capable of supporting higher education institutions, vocational education and training providers, SMEs, and creative organisations seeking to strengthen sustainability, digitalisation, and innovation capacities across the European fashion and Cultural and Creative Sectors and Industries.

Building on the knowledge, methodologies, and innovations generated through the pilot activities, CRAFT-IT4SD conducted a series of training workshops as part of a structured, iterative learning programme. Following the same three-iteration approach adopted in WP4's pilots, the workshops progressively transformed research outcomes, experimental practices, and pilot experiences into transferable learning resources that support knowledge transfer, skilling, upskilling, and reskilling across the Fashion sector and Cultural and Creative Sectors and Industries (CCSI).

4. Development of Learning Ecosystems/Hubs for fashion and related CCSI (task 6.3)

4.1. The methodology

The CRAFT-IT4SD Learning Ecosystems/Hubs are built on synergies and excellence in education across the partner countries. Local communities and stakeholders provide the knowledge and skills necessary to help European CCSI become better prepared to adapt to and contribute to the climate transition toward a knowledge-based economy and a creative, digital, and sustainable society.

Advanced models for skills development, reskilling and upskilling; pathways for running transnational training and mobility; and social issues related to social responsibility, the environment, and climate change will be integrated into these Learning Ecosystems/Hubs. Also, knowledge management of intellectual property rights (IPR) in the fashion and related creative sectors constitutes a distinct section that complements these learning ecosystems/hubs. The consortium follows the same methodology for developing each of the four Learning Ecosystems:

- Setting up Learning Ecosystem Teams (LET)
- Developing Action Plans (AP) by each team
- Building Capacities for Learning Ecosystems/Hubs in the following two directions:
 - Elaborate the **content for micro-credentials-based curricula** to allow creative blended learning
 - Elaborate the **Apps for digital learning technology**, including metaverse and serious gaming.

4.1. Set up the Learning Ecosystem Teams (LET)

Four Learning Ecosystem Teams (LETs) were formed (keeping the lead and collaborators as the ones defined in task 6.1 for the learning Communities), aligned with the project's thematic focus areas. Each team developed an Action Plan aimed at enhancing capacity building, training design, and integration of micro-credentials. These plans laid the foundation for interactive, modular learning content, including case studies, manuals, and game-based educational tools. Learning ecosystems aim to bridge educational innovation and real-world application through blended and digital learning methods. Each LET elaborated on building capacities for Learning Ecosystems using a standard template to collect key components. Following the preparatory activities, the CRAFT-IT4SD consortium has begun developing curricula for the five micro-credentials.

The leader, co-leader, and members of each Learning Ecosystem Team (LET) were nominated, with the support of project partners for development and stakeholders for validation. The result of this activity is a Capacity Building Procedure that outlines the detailed work programme and guidelines for the teams' subsequent activities.

Set up 4 Learning Ecosystem Teams (LET) - Task 6.3.1 & Task 6.3.2.

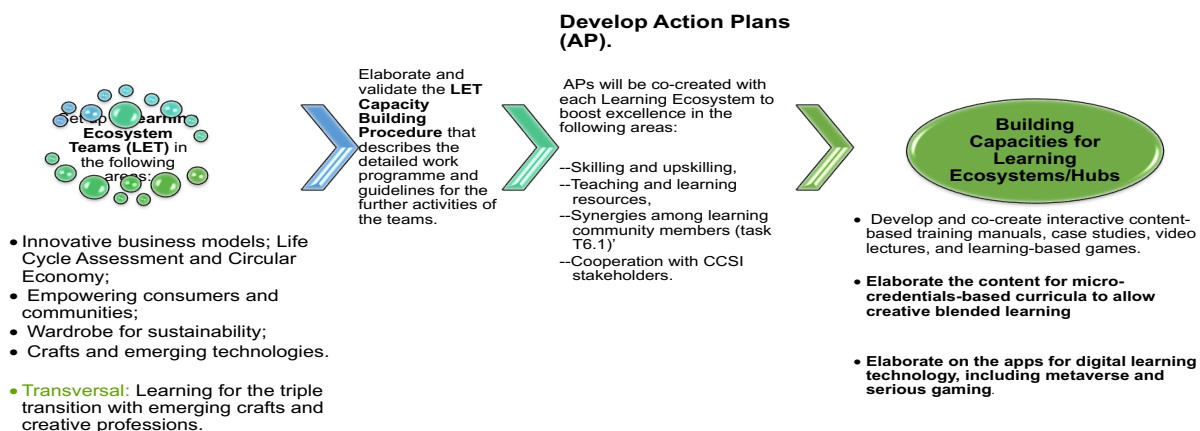


Figure 4.1 Craft-IT4SD methodology for capacity building of the Learning Ecosystems

4.2. Action Plan developed by the CRAFT-IT4SD Learning Ecosystem

Based on insights from all three workshop iterations, the CRAFT-IT4SD and Learning Ecosystem Teams (LETs) have proposed the following common ACTION PLAN, structured into several sections, to support the development of future learning materials and training activities within the project.

Action Plan	Objective	Key Activities	Stakeholders	Expected Impact	Indicative Timeline
AP1 – Sustainability Regulation & Policy Literacy	Strengthen understanding of EU sustainability regulations affecting the fashion sector and CCSI.	• Develop modules/chapters on DPP, Circular Economy policies, and climate reporting; • Integrate policy literacy in curricula; • Create SME case studies.	Universities, SMEs, policy experts, and sustainability consultants	Improved regulatory awareness and capacity to respond to sustainability policies.	Short–Medium term
AP2 – Experiential & Practice-Based Learning	Enhance learning through hands-on experimentation and real-world applications.	• Prototyping workshops, • Hands-on experimentation with textile and/or alternative materials • Design challenges, competitions, and contests,	Design schools, universities, innovation labs, SMEs	Stronger applied sustainability competencies and innovation capacity.	Short–Medium term

		Collections development, fashion shows, and fairs			
AP3 – Digital Technologies for Transparency	Promote digital tools supporting sustainability communication and product transparency.	Training on NFC, digital product passports, interactive media, data visualisation, and digital storytelling.	Technology partners, fashion SMEs, educators, digital media experts	Improved transparency, traceability, and digital literacy in the fashion ecosystem.	Medium term
AP4 – Interdisciplinary Learning Ecosystems	Foster collaboration across design, engineering, business, and cultural heritage and craft fields.	Cross-disciplinary projects, collaborative workshops, interdisciplinary learning labs.	Universities, design institutes, cultural organisations, SMEs	Holistic problem-solving and innovation through cross-sector collaboration.	Medium term
AP5 – Emerging Professional Profiles	Prepare learners for new roles emerging from the green and digital transitions.	Mapping new sustainability-related professions; labour market analysis; career-oriented modules.	Industry partners, universities, and labour market experts	Better alignment between education, industry needs, and employment opportunities.	Medium–Long term
AP6 – Creative & Participatory Learning Methods	Increase engagement through storytelling, gamification, and interactive learning.	Game-based learning modules, digital storytelling exercises, and co-creation workshops.	Educators, designers, digital media specialists	Higher learners' engagement and greater behavioural change towards sustainability.	Short–Medium term
AP7 – Modular & Flexible Learning Formats	Ensure scalability and accessibility of learning materials.	Develop micro-courses, modular training units, and online learning resources.	Universities, training providers, and lifelong learning institutions	Wider adoption of CRAFT-IT4SD learning materials across education and industry.	Medium–Long term

4.3. How the Action Plan (AP) ensure the sustainability of the CRAFT-IT4SD Learning Ecosystem

The **Action Plan** developed by the CRAFT-IT4SD Learning Ecosystem Teams (LETs) comprises seven subsections (see the table above) and aims to support the long-term sustainability and further development of the learning framework created during the project. The Action Plan is based on the insights collected during the three iterations of workshops organised by the project partners. These workshops provided important information about the educational needs of the fashion and related CCSI in relation to sustainability, digital technologies, and new professional skills. Based on these results, a set of strategic actions has been identified in order to guide the future development of learning materials and training activities. The main objective is to ensure that the project results can continue to be used and further developed after the project implementation period.

1. One important direction of the Action Plan is related to the integration of **sustainability policies and regulatory frameworks** into the educational materials. In the European context, the fashion sector is increasingly influenced by new regulations and policy initiatives, such as the Digital Product Passport, the Circular Economy Action Plan, and different requirements related to climate reporting and product transparency. These changes are influencing the entire value chain of the fashion industry. For this reason, it is important that training activities include information about these regulatory developments. By introducing these topics in learning modules, students, designers, and practitioners can better understand the policy context shaping the sector's sustainability transition.
2. Another important aspect identified during the workshops is the relevance of **practice-oriented and experiential learning approaches**. Participants emphasised that practical activities help learners better understand sustainability concepts and their real applications in the fashion industry. Activities such as prototyping, experimenting with materials, digital fabrication (e.g., 3D printing), virtual prototyping, and collaborative design exercises allow learners to explore sustainable solutions in concrete ways. For this reason, the CRAFT-IT4SD learning framework promotes educational formats that combine theoretical explanations with practical experimentation, hands-on workshops, creative ateliers and collaborative learning activities.
3. The Action Plan also highlights the growing role of **digital technologies in supporting sustainability and transparency** in the fashion and related CCSI. Technologies such as NFC systems, digital product passports, interactive media tools, and data visualisation tools can help communicate sustainability information and improve product traceability. Integrating these technologies into educational activities helps learners understand how digital solutions can support sustainable value chains and enable new forms of communication between brands and consumers. In addition, the use of digital storytelling and interactive media can make sustainability topics more accessible and engaging for learners.
4. Another important element of the Action Plan is the promotion of **interdisciplinary collaboration within learning environments**. Sustainability challenges in the fashion sector require knowledge across design, engineering, business, digital technologies, and cultural heritage. The workshops showed that collaborative learning activities involving participants from different disciplines can stimulate innovation and creative thinking. Therefore, the CRAFT-IT4SD learning framework encourages interdisciplinary learning formats that bring together students, researchers, designers, and industry representatives to work on sustainability-related topics.
5. At the same time, the Action Plan addresses the need to prepare learners for **new professional roles emerging from the green and digital transitions** of the fashion and related CCSI sector. As sustainability requirements and digital technologies become more important in the industry, new professional profiles are emerging that require a combination of technical, creative, and sustainability-related competencies. Educational activities should therefore support learners in understanding these changes and developing the skills needed for future employment in sustainable fashion, circular design, and digital product innovation.
6. Finally, the Action Plan promotes the development of **flexible and modular learning formats**, which can support the long-term use of the project results. By structuring the learning materials as modular units or

micro-courses, the educational resources developed within CRAFT-IT4SD can be more easily integrated into different educational contexts. These may include university programmes, professional training activities, and lifelong learning initiatives. This flexibility increases the likelihood that the learning materials will continue to be used for up- and reskilling by educational institutions, SMEs, designers, and other stakeholders, even after the project ends.

The proposed common multilevel **Action Plan** provides a structured approach to supporting the sustainability and long-term impact of the CRAFT-IT4SD learning framework. By combining policy awareness, practical experimentation, digital technologies, interdisciplinary collaboration, and flexible educational formats, the Action Plan contributes to developing a sustainable learning ecosystem that supports the European fashion and textile sector's transition to more sustainable, circular practices.

4.4. Building capacities for CRAFT-IT4SD Learning Ecosystem/Hub

Building Capacities for **Learning Ecosystems/Hubs** is based on the following key components: **People, Content, Learning Technology, Learning Culture** and **Strategy**. In relation to WP6, the Craft-IT4SD consortium aimed to initiate and to **develop a Learning Ecosystem that serves as a HUB** consisting of two main components:

- **Core teams:** These teams, known as the **Learning Ecosystem Teams (LETs)**, are made up of members from the CRAFT-IT4SD consortium.
- **Stakeholders and Beneficiaries:** This group includes participants in activities, students, researchers and academics, artisans, and craft enthusiasts. These individuals enhance the Learning Ecosystem by sharing knowledge, skills, best practices, and more.

The Learning Ecosystem Team (LET) elaborated on Building Capacities for Learning Ecosystems based on a common approach for collecting the key components of the following **five MICRO-CREDENTIAL BASED CURRICULA**. Micro-credentials have emerged as a transformative force in education, offering flexible, targeted learning opportunities that align closely with industry needs and lifelong learning paradigms. In a time marked by rapid technological progress and evolving workforce needs, higher education institutions must continually adapt to promote lifelong learning and career flexibility. By recognising and certifying particular skills and competencies, micro-credentials can boost student motivation, engagement, and employability in an ever-evolving job market.

Technological innovations, such as AI and various digital tools, are transforming the learning process by improving personalisation and interactivity. Micro-credentials are increasingly becoming a key component of formal education, offering tailored learning experiences and blurring the distinctions between formal and informal learning paths. In response to shifts in the labour market, Micro-credentials quickly adapt to meet new skill demands, helping to close skills gaps and improve employability. The concept of stackable credentials and credential portfolios is reshaping learning pathways, enabling learners to build a flexible and comprehensive skill set. Blockchain technology guarantees the credibility and transferability of micro-credentials, fostering trust in the digital era. Ultimately, the global spread of micro-credentials links learners across the world, creating a borderless educational landscape.

In this respect, the CRAFT-IT4SD consortium developed guides, templates, content-based training manuals, presentations, video lectures, and learning-based games in line with the above-mentioned principles. The content created for the training workshops was structured into micro-credential-based curricula to enable creative blended

learning, in which the role of the trainer/lecturer is supplemented by digital learning technology. Access to the developed content is free, under Open Educational Resources (OER) for teaching, learning and research materials, copyright-protected as open source.

The CRAFT-IT4SD project is focused on integrating crafts, fashion, and sustainability. To reflect the growing demand for sustainable practices in the creative industries, the curricula for the CRAFT-IT4SD micro-credentials align with the project's methodological approach. Thus, the following key knowledge and skills were included: *design thinking and problem-solving approach, craft techniques and digital innovation, business models and consumer empowerment, collaborative work, and cultural and social impact*. Moreover, the CRAFT-IT4SD micro-credentials employ innovative learning formats, such as *training workshops and hands-on ateliers, to enable participants to create, test, and prototype their ideas, engage in collaborative and interactive learning, and apply their learning through work/project-based applications*.

4.5. Development, validation and refinement of the CRAFT-IT4SD micro-credentials

The development of the CRAFT-IT4SD micro-credentials followed a **structured and iterative process** aimed at transforming research outcomes and pilot experiences into flexible, high-quality learning opportunities that respond to the evolving competence needs of the Cultural and Creative Sectors and Industries (CCSI), in particular to Fashion industries. Building upon the **European approach to micro-credentials**, the consortium adopted a **learner-centred methodology** that combines clearly defined learning outcomes, competence-based assessment, quality assurance principles and **alignment with the European Qualifications Framework (EQF)**, while maintaining the flexibility required for lifelong learning and continuous professional development.

Unlike traditional curriculum development processes, the CRAFT-IT4SD approach was characterised by **continuous refinement through co-creation, experimentation and validation**. The initial curriculum concepts were developed based on the project's competence analysis and research activities, but their final structure emerged progressively through the implementation of the pilot activities (WP4), the training workshop series (WP6/T6.2) and the interactions facilitated by the Learning Community (WP6/T6.1). This **iterative methodology** reflects the Design Thinking philosophy adopted throughout the project, in which educational content was continuously tested, evaluated, and improved using feedback from students, educators, researchers, craftspeople, designers, SMEs, and **innovation stakeholders**.

The implementation of the four European pilot ecosystems in Romania, Denmark, Finland and Spain provided an essential testing environment for validating both the technical content and the pedagogical approaches embedded within the micro-credentials. Rather than evaluating learning materials in isolation, **the consortium integrated them into real educational and innovation contexts**, where participants applied newly acquired knowledge through collaborative projects, design challenges, material experimentation and prototype development. This approach enabled continuous refinement of learning outcomes, teaching methods and assessment strategies while ensuring that the proposed curricula remained closely aligned with the practical needs of the creative industries.

The sixteen training workshops organised under WP6 represented a second layer of validation of the micro-credentials. Designed as a coherent European training workshop program organised over three iterative cycles, the workshops progressively transformed research findings and pilot experiences into transferable educational resources. **The first iteration established a common understanding** of sustainability, circular economy and digital transformation within the fashion ecosystem, creating a shared conceptual foundation among participants. **The second iteration shifted the focus towards experimentation and co-creation**, enabling participants to explore new materials, digital technologies, climate impact assessment, circular business models and collaborative design

processes through practical activities. Finally, **the third iteration demonstrated the maturity of the educational methodology** by integrating sustainability, digital technologies, craftsmanship, and entrepreneurship into interdisciplinary innovation projects that address complex real-world challenges. The progression across the three iterations confirmed the effectiveness of an iterative learning model in supporting competence development and demonstrated how micro-credentials can evolve through continuous validation rather than remaining static educational products.

An equally important **contribution to the refinement of the curricula came from the CRAFT-IT4SD Learning Community**. The Learning Community functioned as a European knowledge ecosystem, facilitated by the LinkedIn platform, where project partners continuously disseminated pilot results, published thematic knowledge resources and facilitated peer learning among educators, researchers, SMEs, designers and craftspeople. The knowledge resources produced during the project complemented the formal curricula by providing up-to-date examples, case studies, methodological reflections and emerging practices related to sustainability, digital innovation, cultural heritage, entrepreneurship and future professional skills. The discussions generated around these resources helped identify emerging competence requirements, validate the relevance of proposed learning outcomes and enrich the educational content with **examples drawn directly from industrial practice** and regional innovation ecosystems.

The CRAFT-ITSD micro-credentials therefore extend beyond the acquisition of isolated technical skills. They **promote an interdisciplinary understanding of sustainability by integrating environmental responsibility, digital transformation, craftsmanship, entrepreneurship and cultural heritage** within a coherent educational framework. Throughout the curricula, learners are encouraged to apply Design Thinking methodologies, collaborate in multidisciplinary teams, engage in challenge-based learning, experiment with innovative materials and digital technologies, and develop practical solutions inspired by real industrial and societal needs. These pedagogical principles support the development of both technical competences and transversal skills, including creativity, systems thinking, collaboration, communication and critical reflection.

Another important outcome of the project is the establishment of common educational principles that are consistently reflected across all CRAFT-IT4SD micro-credentials. Regardless of their thematic focus, the learning units combine theoretical foundations with practical application through interactive workshops, collaborative projects, prototype development, peer learning and real-world case studies. The curricula **encourage learners to move iteratively between conceptualisation, experimentation, evaluation and refinement**, closely mirroring professional innovation processes within the creative industries. This educational philosophy creates flexible learning environments that adapt to diverse learner profiles while maintaining strong links to labour market needs.

The thematic content of the micro-credentials reflects the project's four strategic pillars: **innovative business models, wardrobe for sustainability, empowering consumers, and crafts with emerging technologies**. Consequently, the learning activities address topics such as sustainable fashion systems, circular economy, Design Thinking, digital fabrication, additive manufacturing, printed electronics, Digital Product Passports, artificial intelligence, heritage-inspired innovation, consumer engagement and entrepreneurship. Rather than treating these subjects independently, the curricula demonstrate their interconnections and encourage learners to integrate knowledge from different disciplinary domains when developing innovative products, services and business solutions.

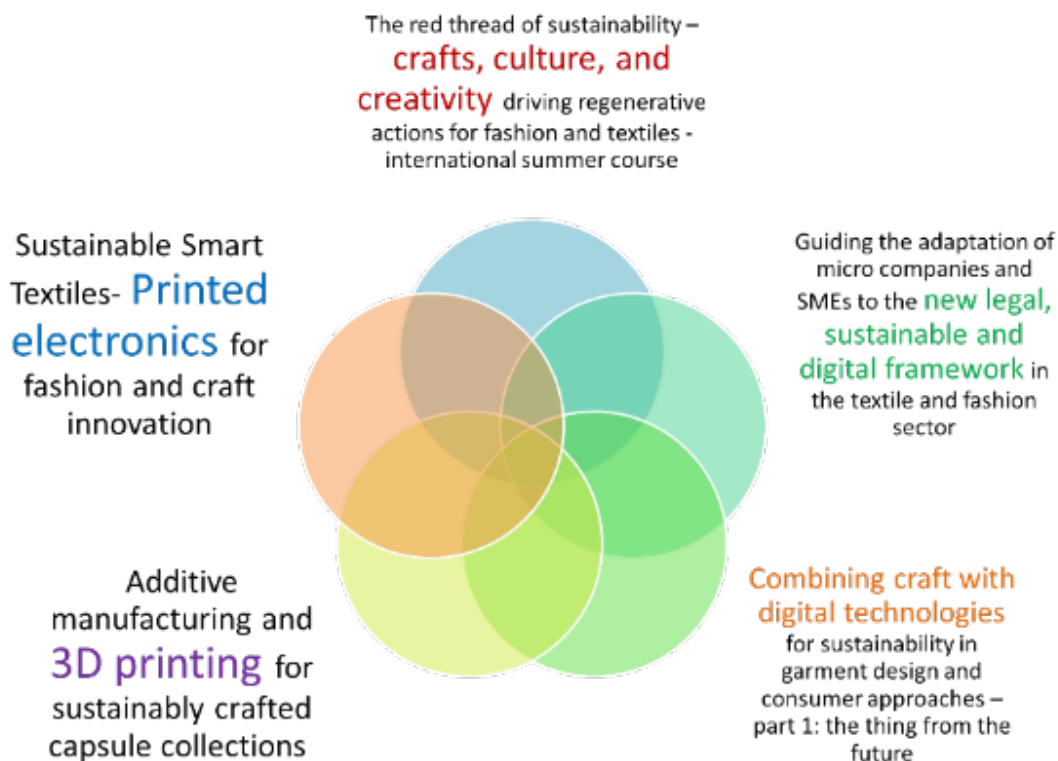
The five micro-credentials were defined, validated and refined at every stage of the project development, and their final structure is presented in Annex 2 for each of the following curricula:

- The red thread of sustainability – crafts, culture, and creativity driving regenerative actions for fashion and textiles - international summer course.
- Guiding the adaptation of micro companies and SMEs to the new legal, sustainable and digital framework in the textile and fashion sector

- Combining craft with digital technologies for sustainability in garment design and consumer approaches – part 1: the thing from the future
- Additive manufacturing and 3D printing for sustainably crafted capsule collections
- Sustainable smart textiles- Printed electronics for fashion and craft innovation

The iterative validation process also demonstrated the importance of close collaboration between higher education institutions, vocational education and training providers, SMEs, designers, craftspeople and regional innovation organisations. By involving these stakeholders throughout curriculum development, the project ensured that the proposed learning outcomes correspond to current and emerging competence needs while supporting the recognition and transferability of micro-credentials across different educational and professional contexts. This collaborative approach strengthens the relevance of the learning offer and creates stronger links between education, research and innovation ecosystems.

Overall, the work undertaken in WP6 confirms that micro-credentials should not be regarded simply as short courses or modular learning units. Within CRAFT-IT4SD, they became the educational building blocks of a broader European Learning Ecosystem that integrates research, experimentation, knowledge exchange and collaborative innovation. The Learning Community, the European Training Workshop Series and the pilot ecosystems collectively transformed research outcomes into transferable educational methodologies capable of supporting knowledge transfer, skilling, upskilling and reskilling. As a result, the CRAFT-IT4SD micro-credentials provide a flexible and future-oriented educational model that can be adopted by higher education institutions, vocational education and training providers, SMEs and lifelong learning organisations, contributing to the long-term resilience and competitiveness of the European TCLF, fashion and CCSI.



4.6. Why are the CRAFT-IT4SD micro-credentials innovative?

The **CRAFT-IT4SD** project is focused on integrating **crafts, fashion, and sustainability**. To reflect the growing demand for sustainable practices in the creative industries, the curricula for the CRAFT-IT4SD micro-credentials align with the project's methodological approach. Thus, the following **key knowledge** and **skills** were included:

- **Design thinking** and **problem-solving** through hands-on design challenges, prototyping, and feedback sessions, allowing learners to solve real-world problems around sustainable fashion and crafts.
- **Craft techniques** and **digital innovation**. The CRAFT-IT4SD micro-credentials cover traditional craft techniques and the exciting realm of digital innovation. We blend craftsmanship with new technologies, such as digital tools and 3D printing, to push the boundaries of what's possible in sustainable fashion design. The new learning content explores how innovation in traditional craft techniques can be applied to modern sustainable fashion design, opening up a world of possibilities. Given the increasing role of digital technologies in fashion and creative industries, the CRAFT-IT4SD training workshops will demonstrate how to use design software and manage online businesses for craft or fashion products, along with the ethical considerations of digital practices in sustainability.
- **Business models** and **empowering consumers**: Understanding sustainable fashion and market dynamics is a key focus of this micro-credential. It's not just about learning, but about preparing learners for the industry's current and future challenges. This micro-credential is focused on understanding the new legislation and engaging with consumers who prioritise sustainability. New business models based on sustainable practices in craft and fashion include eco-friendly materials, waste reduction, the circular economy, ethical sourcing, environmental impact, and the integration of sustainability into production processes.
- **Collaborative work**. A key feature of the CRAFT-IT4SD project approach is co-creation. Therefore, the curricula will include collaborative projects where learners co-create solutions, products, or designs. This will simulate a real-world craft and fashion design environment where collaboration with clients, artisans, and other designers is crucial.
- **Cultural and social impact**. Incorporating the cultural heritage and social dimensions of crafts, fashion, and sustainability is not just an option; it's essential. The CRAFT-IT4SD micro-credentials include learning about the preservation of traditional crafts, the role of artisans in the community, and the social responsibility that comes with sustainable production practices. This holistic approach to sustainability considers not just the environmental impact but also the broader societal implications.

To ensure that the curricula align with the **design thinking** and **co-creation** methodologies, the five curricula for micro-credentials apply the innovative learning formats:

- **Interactive workshops** to allow participants to create, test, and prototype their ideas.
- **Collaborative learning**. Practical activities and exercises include group activities and projects encouraging peer-to-peer learning and collaboration.

- **Iterative learning.** The content of the micro-credentials is a “working-in-progress” activity based on design thinking’s “build, test, and iterate”.
- **Real-world applications** where the learners will work with real-world case studies, pilot projects, or collaborations with artisans and sustainable fashion brands.

For the CRAFT-IT4SD project, the micro-credentials curricula focus on integrating **sustainability, craftsmanship, innovation, and collaboration**. Emphasising design thinking and co-creation throughout the process will ensure that the curricula impart knowledge and enable its application in real-world contexts. It is important to incorporate flexibility in the design so that the curricula can evolve and improve based on feedback from pilot iterations. This approach will create a learning experience that is dynamic and responsive to the changing needs of the industry.

5. CONCLUSIONS

In the reporting period (M1-M30), the entire consortium focused on designing, launching, and validating capacity-building structures (such as Learning Community, Learning Ecosystem Teams, Action Plans, knowledge-sharing hubs, and laboratories) that support skills development and learning. Work Package 6 successfully transformed the knowledge, methodologies, and innovations generated throughout the CRAFT-IT4SD project into a coherent European learning framework that supports the green, digital, and social transition of the Cultural and Creative Sectors and Industries (CCSI), particularly the Fashion industries. Rather than implementing isolated training activities, WP6 established an **integrated learning ecosystem** that combines collaborative knowledge exchange, experiential learning, competence development and transferable educational methodologies.

A major achievement of the work package has been the creation of the **CRAFT-IT4SD Learning Community**, which evolved beyond a communication platform into an active European knowledge ecosystem. Structured around four thematic communities—**Innovative Business Models, Wardrobe for Sustainability, Empowering Consumers, and Crafts & Emerging Technologies**—the Learning Community facilitated interdisciplinary dialogue among craftspeople, designers, researchers, educators, SMEs and students. Through the publication of **36 knowledge resources**, thematic discussions and peer-learning activities, it created a sustainable repository of knowledge that will continue to support learning and innovation beyond the project's lifetime.

The **CRAFT-IT4SD Training Workshop** series represented another key outcome of WP6. Organised as an integrated programme of fifteen Training Workshops delivered through three iterative learning cycles, the workshops progressively transformed research outcomes and pilot experiences into practical educational resources. The iterative methodology enabled participants to move from awareness and exploration to experimentation, co-creation and the integration of innovative solutions, demonstrating the effectiveness of challenge-based and interdisciplinary learning approaches for developing future skills in the creative industries.

The work package also validated an innovative approach to curriculum development based on **micro-credentials**. Through continuous refinement during the pilot activities (WP4), research outputs from WP5, Training Workshops (WP6/T6.2), and Learning Community discussions (WP6/T6.1), the proposed curricula evolved into flexible, competence-based learning pathways that integrate sustainability, digital technologies, craftsmanship, entrepreneurship, and cultural heritage. This **iterative validation process** ensured that the educational content

responds to real labour market needs while remaining compatible with European frameworks for lifelong learning, qualification recognition and skills development.

An important contribution of WP6 is the establishment of a **transferable educational model** that connects research, innovation, education and industry. By combining pilot experimentation, collaborative learning, knowledge resources, training workshops, learning ecosystems and micro-credentials within a single methodological framework, CRAFT-IT4SD demonstrates how research results can be transformed into practical learning opportunities that support **knowledge transfer, skilling, upskilling and reskilling** across Europe.

Beyond its direct project outputs, WP6 provides a sustainable legacy for future educational and innovation initiatives. The methodologies, knowledge resources, training models and collaborative practices developed during the project can be readily adopted by higher education institutions, vocational education and training providers, SMEs, regional innovation ecosystems and lifelong learning organisations.

In this way, **the CRAFT-IT4SD Learning Ecosystem extends the project's impact beyond its duration, contributing to a more resilient, innovative and sustainable European fashion and CCSI ecosystem while supporting the emergence of new professional profiles and competence pathways required by the green, digital and social transition.**

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ANNEX 1 – Contribution to the Learning Community

WORKSHOP – ACTIVATION WORKSHOP	
20.03.2025, Barcelona	
Contact Person from Pilot Team (Name and contact info)	Juliana Penagos Nigrinis (julianapenagos@modacc.cat) Lidia Morcillo (lmorcillo@modacc.cat)
Describe the workshop and the workshop format (max 500 characters)	Empower participants to drive and align their company with a systemic vision that integrates sustainability, circularity, and impact measurement, enabling them to lead change effectively and strategically. We also want to create a common language for sustainability among our networks.
Experimentation / Investigation conducted	Identify key sustainability and circularity challenges and transform them into business opportunities. Develop actionable strategies to implement sustainable and circular solutions along the fashion value chain. Strengthen leadership skills by creating decision-making scenarios.
Crafts techniques applied	No craft techniques were applied, as the focus was to set a common ground on knowledge about sustainability, circularity and impact
Technologies applied	Participants were introduced to measurement methodologies regarding environmental impact measurement and to technologies that are used to perform the mentioned analyses.
Business Models tested	Business models were not tested as such, but an introduction to sustainable and circular business models was made, as well as included in a dynamic activity of impact evaluation of the textile and fashion supply chain.
Sustainability Measures applied	Introduction to measurement tools and to existing indexes to evaluate sustainability measures was included.
Number of Participants	15
Stakeholder group(s): who participated?	Professionals of Catalan fashion and textile SME's, entrepreneurs and young professionals open to work.
Preliminary Results	Participants showed a clear increase in awareness and engagement with sustainability and circularity. They expressed greater confidence in applying the knowledge gained within their companies and projects. The workshop successfully created a baseline for subsequent activities, enabling richer discussions and networking opportunities among participants, which strengthened the local ecosystem.
Insights & Learnings	While the workshop proved highly valuable in content and engagement, challenges remain regarding participation. In-person attendance is demanding for SMEs due to time and mobility constraints. There is a need to balance the depth of content with accessibility, ensuring that knowledge transfer does not lose impact when adapted to more flexible formats. Peer-to-peer exchange emerged as a strong driver of learning and motivation.
Future Scope and Recommendations for Including the Workshop as Learning Material	The workshop should continue to be offered to new members and actors in the Catalan fashion and textile ecosystem to establish a common baseline on sustainability knowledge. A modular structure with certification could further increase engagement, recognition, and impact, while also providing flexibility for SMEs. Incorporating digital or hybrid formats may help overcome participation barriers, ensuring broader reach without compromising on quality.
If Recommendations for Interactive Learning Objects, please add	Consider developing:

	• Scenario-based decision-making simulations to replicate sustainability challenges in SMEs. • Modular e-learning units (short videos, quizzes, case studies) to reinforce in-person workshops. • Interactive supply chain mapping tools that allow participants to visualize impacts and evaluate circular strategies in real time.
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CRAFT IT4SD workshop: Gamification	
15/05/2025 Teams	
Contact Person from Pilot Team (Name and contact info)	Jan Julin, jan.julin@oamk.fi
Describe the workshop and the workshop format (max 500 characters)	The workshop, held online on May 15, 2025, focused on gamification and was led by Jan Julin. It included a presentation, practical exercises, and interactive discussions. Participants explored how to apply gamification in craft and sustainability contexts
Experimentation/ Investigation conducted	Participants examined existing games to understand design structures and evaluated tools for creating accessible, educational games. The participants also developed ideas for educational games
Crafts techniques applied	The game introduced in the workshop focused more on the digital representation of traditional fish leather tanning rather than hands-on crafting.
Technologies applied	Web-based game development platforms
Business Models tested	The Open Connector Platform was tested as a potential business model for SMEs to add value to garments through digital perks. Each item could be linked to unique content, such as educational games, enhancing product storytelling and customer engagement.
Sustainability Measures applied	Use of waste materials (fish skin) Promotion of circular economy through reuse and digital transparency Educational outreach via gamification to raise awareness of sustainable practices
Number of Participants	13
Stakeholder group(s): who participated?	Participants included students, unemployed individuals, researchers, university staff, and representatives from design labs and innovation centers across Europe.
Preliminary Results	Participants found the workshop useful and inspiring. Feedback highlighted the value of the practical exercise and the potential of gamification in future projects. Some suggestions included offering a series of workshops and incorporating participant introductions.
Insights & Learnings	Gamification can effectively communicate complex craft processes. Low-code tools enable rapid prototyping of educational games. Cross-disciplinary collaboration enhances learning outcomes.

Future Scope and Recommendations for Including the Workshop as Learning Material	The workshop format is well-suited for inclusion in micro-courses on sustainable design, digital storytelling, and gamification. Future iterations could include more hands-on game development and co-creation with students and artisans.
If Recommendations for Interactive Learning Objects, please add	A simplified game editor template for students to create their own craft-based games Interactive tutorials on NFC tag integration Case-based learning modules using the <i>From Fish to Wonder</i> game as an example
Please, share documentation: Making of video: https://www.youtube.com/watch?v=neaxcrnWs4w From fish to wonder game: Unity WebGL Player Pilot1 WasteToWonder Miro board from gamification workshop: aarhusuniversitet.sharepoint.com/sites/CRAFT-IT4SD/Shared Documents/Forms/AllItems.aspx?id=%2Fsites%2FCRAFT-IT4SD%2FShared Documents%2F06 WP6 Skills and Learning Communities%2FT6%2E2 Exchanging Good Practices and Peer Learning%2FWorkshop May 2025 Jan Julin%2FWorkshop May 25 Results%2Epdf&parent=%2Fsites%2FCRAFT-IT4SD%2FShared Documents%2F06 WP6 Skills and Learning Communities%2FT6%2E2 Exchanging Good Practices and Peer Learning%2FWorkshop May 2025 Jan Julin	

WORKSHOP - ADDITIVE MANUFACTURING AND 3D PRINTING ON FLEXIBLE MATERIALS	
15.05.2025, Iasi	
Contact Person from Pilot Team (Name and contact info)	Dorin Ionesi (savin-dorin.ionesi@academic.tuiasi.ro) Radu Firicel (radu.firicel@student.tuiasi.ro) Iuliana Streba (iuliana.streba@student.tuiasi.ro)
Describe the workshop and the workshop format (max 500 characters)	Using additive technologies, the onsite workshop explored 3D printing on textiles as a way to translate traditional symbols into contemporary creations, revitalizing crafts through a modern and innovative visual language. It enabled hands-on experimentation with materials and techniques, encouraging creativity and a dialogue between tradition and innovation.
Experimentation / Investigation conducted	Participants investigated the interaction between various textile substrates (e.g., cotton, linen, synthetic fabrics) and 3D printing materials. They explored optimal adhesion techniques, print settings, and design constraints for successful integration. Additionally, traditional Romanian patterns were reinterpreted using parametric design tools to evaluate their adaptability to additive manufacturing.
Crafts techniques applied	Traditional Romanian textile motifs and embroidery patterns were analyzed and stylized for digital reinterpretation. Participants applied techniques inspired by weaving, stitching, and ornamental symmetry, translating them into 3D printable forms. The workshop emphasized the aesthetic and symbolic value of folk designs, integrating them with contemporary fabrication methods to create hybrid artifacts that honor craft heritage while embracing innovation.
Technologies applied	The workshop utilized FDM (Fused Deposition Modeling) 3D printing technology to apply thermoplastic materials (PLA) directly onto textile surfaces. CAD software was used for designing patterns inspired by traditional motifs, while slicing software optimized print settings for textile compatibility. Participants also explored parametric design tools to adapt folk symbols into printable geometries, and tested

	various printer bed temperatures and nozzle settings to ensure adhesion and material flexibility.
Business Models tested	-
Sustainability Measures applied	The workshop promoted sustainability by using biodegradable or recyclable 3D printing materials (PLA). Textile substrates were sourced from fabric scraps and upcycled garments to reduce waste.
Number of Participants	33
Stakeholder group(s): who participated?	Participants included students of TUIASI from three study programs: Industrial Engineering, Engineering and Management, and Industrial Design. Their diverse academic backgrounds facilitated an interdisciplinary approach, combining technical knowledge, strategic thinking, and creative design in the exploration of 3D printing on textiles.
Preliminary Results	During the workshop, various textile surfaces were enhanced with 3D-printed traditional Romanian motifs, such as geometric patterns, solar symbols, and stylized flora. These were digitally redesigned and printed using thermoplastics onto cotton, linen, and polyester fabrics. The resulting hybrid materials combined the tactile qualities of textiles with the relief and precision of additive manufacturing, creating contemporary surfaces that celebrate cultural heritage through innovation.
Insights & Learnings	Participants gained a deeper understanding of how traditional cultural symbols can be reinterpreted through digital tools and additive manufacturing. The hands-on process highlighted the importance of material compatibility, surface texture, and design adaptability.
Future Scope and Recommendations for Including the Workshop as Learning Material	The workshop demonstrates strong potential as a multidisciplinary learning module, bridging engineering, design, and cultural studies. It is recommended to integrate this format into curricula focused on sustainable design, digital fabrication, and heritage innovation. Future iterations could include more advanced modelling techniques, collaborations with artisans, and real-life product development challenges. The approach encourages experiential learning, critical thinking, and creative engagement with both tradition and technology.
If Recommendations for Interactive Learning Objects, please add	Develop digital tools such as editable libraries of traditional motifs, short video tutorials, and virtual simulations of 3D printing on textiles. These resources can support hands-on learning, enhance understanding of material behavior, and make the workshop content accessible in blended or remote learning formats.

WORKSHOP - AIDC WORKSHOP FOR COMPANIES	
28.05.2025, Herning	
Contact Person from Pilot Team (Name and contact info)	Klaus Greve True (klgt@via.dk) Martin Storkholm Nielsen (mstn@via.dk)
Describe the workshop and the workshop format (max 500 characters)	The workshop introduced NFC (Near Field Communication) as an accessible AIDC (Automatic Identification and Data Capture) technology to students in design and business. Participants experimented hands-on with NFC tags using their own smartphones and explored how AIDC can create value in design, branding, and retail. Conceptual input was paired with playful exploration, case work, and group reflection.
Experimentation / Investigation conducted	Students tested and wrote data to different types of NFC tags using apps such as NFC Tools. They explored reading from and writing to the tags, tested their range and storage limits, and experimented with automations. A group exercise tasked them with applying AIDC technologies to a value chain case (Steam Coffee), highlighting use cases for ESG reporting, traceability, and transparency.
Crafts techniques applied	Students worked with NFC tags in physical formats relevant to design and fashion contexts: flexible stickers and button tags attachable to textiles using Prym pliers.

	While not explicitly a crafts-focused workshop, the session included examples of e-threads and embedded NFC in garments, prompting reflection on the integration of digital tech into material-based design practices.
Technologies applied	The workshop focused on NFC tags, smartphones (iOS/Android), and mobile apps like NFC Tools, NFC Tasks, Shortcuts, and MacroDroid. Students used these to read and write data, create automations, and test NFC functionalities. Concepts such as blockchain and IoT, and platforms like the Open Connector Platform were introduced to contextualize NFC within the broader landscape of AIDC technologies.
Business Models tested	The Steam Coffee case exercise challenged students to apply AIDC technologies to real-world business scenarios, with emphasis on traceability, sustainability, and value creation across supply chains. Students reflected on how NFC and other AIDC tech can support ESG reporting, enhance customer experience, and differentiate brands through digital-physical interaction.
Sustainability Measures applied	The workshop explored how NFC can support sustainability indirectly—through enhanced transparency, lifecycle tracking, and reduced need for printed materials. The Steam Coffee case explicitly addressed environmental and social impact across value chain touchpoints.
Number of Participants	16
Stakeholder group(s): who participated?	Participants were Danish and international students from the <i>Retail Design & Business</i> and <i>Branding & Marketing</i> specializations within the PBA Design & Business program at VIA University College, Denmark. The mix of backgrounds fostered an interdisciplinary dialogue between technology, design, and business.
Preliminary Results	All students successfully interacted with NFC tags, writing and reading various data types (URLs, text, timers). Several expressed excitement upon realizing they could use the tags independently and immediately in their personal or project work. The Steam Coffee case enabled applied thinking around NFC's role in business contexts, producing novel ideas for digital integration and user experience design.
Insights & Learnings	NFC's low adoption barrier (due to built-in smartphone support) enabled quick engagement and experimentation. The session demonstrated that even simple technologies can open rich discussions on value creation, digital integration, and sustainable innovation. Hands-on use was crucial to demystify the technology and inspire real-world application.
Future Scope and Recommendations for Including the Workshop as Learning Material	This workshop shows strong potential as a recurring or modular component in interdisciplinary design and business education. Future iterations should allow for more time, deeper experimentation, and individual exploration between sessions. Follow-up workshops could include prototyping NFC-enabled products, integration with storytelling or service design, and exploration of back-end infrastructure (databases, APIs, etc.).
If Recommendations for Interactive Learning Objects, please add	Develop short tutorial videos for using NFC tools and apps, a collection of mini-case studies for ideation, and digital exercises for simulating NFC-enabled user journeys. Consider creating a shared bank of use-case inspiration from fashion, retail, and sustainability contexts.

WORKSHOP TITLE	
DATE/VENUE	
Contact Person from Pilot Team (Name and contact info)	Fredrik Timour and Lisa Lang, info@fashioninnovationcenter.org
Describe the workshop and the workshop format	Fashion Innovation Center (FIC, SE) arranged a cocreation training workshop together with Flair.Fashion on hybrid format 14.5.2025. Within this workshop students were enabled about EU policies

(max 500 characters)	on sustainability compliance and teamed up with brands to create new digital opportunities for fashion brands. Agenda Introduction to upcoming global legislation, with a focus on regulations by the European Union and the Digital Product Passport - Partner with fashion designer from curated list to develop a new concept - Prepare concepts and present to group - Feedback - Q&A
Experimentation Investigation conducted	The objective was to enable participants to understand the legal requirements of the European Union's Digital Product Passport and beyond; and to create a digital layer and explore new opportunities and user-based experiences for fashion brands and businesses.
Crafts techniques applied	-
Technologies applied	Open Connector Alliance Platform (OCA Platform) and NFC tags
Business Models tested	New business models in the intersection of physical and digital Digital twinning New marketing tools
Sustainability Measures applied	Digital Product Passport as part of design.
Number of Participants	25
Stakeholder group(s): who participated?	SMEs, fashion designers and students currently enrolled in fashion programmes.
Preliminary Results	Beta products and services, and innovative new marketing campaigns for the brands. In addition to these, students' digital skills were upskilled and they learned about EU policies affecting their work.
Insights & Learnings	There was a huge enthusiasm, willingness and capabilities to explore new business models and innovative ways to become more sustainable within the fashion industry. Students were very keen on continuing training. As for our own learning, we decided to run this workshop on a regular basis once or twice a year based on the demand and excitement of students.
Future Scope and Recommendations for Including the Workshop as Learning Material	There are two pillars of which this workshop is based on: policy and OCA Platform Policy slides do not withstand time; therefore, policy slides need to be updated before every run due to new policy updates on the current status of sustainability and competitiveness policies regarding the fashion industry. As time also goes by, the element of compliance from EU on DPP and other reporting directives CSRD and CSDDD evolves also. Educator must be familiar with OCA Platform with NFC tag in order to utilise those within this workshop.

If Recommendations for Interactive Learning Objects, please add	Soft skills: Listen and hear students' concerns and take those concerns seriously. Acknowledge the emotional state of fashion students because they are students within an industry that is falling apart. That puts them under a great stress. This course is about future and hope – emphasise new ways things can be done. Hard skills: For the trainer, it is absolutely essential to have their own profile in OCA Platform and have the NFC tags. It is essential to have worked with these before running the workshop.
Please, share documentation: Images and visualisations Links to videos, to presentations, process documentation (miro board, Trello board etc.)	

New professional profiles arising from the new environmental regulatory framework	
28.10.25/Igualada Fashion Lab	
Contact Person from Pilot Team (Name and contact info)	Juliana Penagos Nigrinis Julianapenagos@modacc.cat
Describe the workshop and the workshop format (max 500 characters)	Objective/Aim: The main objective of the workshop is to share information about new occupations driven by changes in environmental legislation in the textile and fashion sector, supporting the dynamization and regeneration of the Catalan fashion industry. Specific Objectives: • Share insights on the main professional profiles emerging from the transition toward a circular industrial model in the textile sector, with a particular focus on the implementation of Extended Producer Responsibility. • Present the detailed descriptions of these professional profiles, outlining the specific characteristics of each identified occupation. • Explain the classification of these professions according to their position in the value chain and the types of stakeholders involved in the sector, following a Life Cycle Assessment-based methodology. • Provide an overview of the quantitative estimations of employment volumes generated by the circular textile industrial flow in Catalonia. • Share recommendations for key stakeholders in the Catalan textile ecosystem to support the promotion of employment linked to new environmental legislation. Agenda/Topics: • Introduction to the new horizons and new professions • Objectives • Methodology • Overview of the environmental regulatory framework • The relevance of transforming the Value Chain • Current employment data in the Textile and Fashion Sector • Future Scenarios of employment in the sector • New professional profiles for future scenarios • Recommendations and guidelines for the industry
Experimentation / Investigation conducted	Research on new professional profiles

Crafts techniques applied	none
Technologies applied	none
Business Models tested	none
Sustainability Measures applied	none
Number of Participants	60
Stakeholder group(s): who participated?	Multiple stakeholder groups from the Catalan textile and fashion ecosystem, including: • Fashion brands (SMEs) • Manufacturers • Governance entities • Consulting firms • Big enterprises • Designers • Students Number of participants: 60
Preliminary Results	The transition to a circular and environmentally safer textile industry in Catalonia can generate significant green employment and position the region as a Southern European benchmark in recycling and reuse. Successful transformation requires coordinated action among government, businesses, the education sector, and citizens across all stages of the textile product life cycle. The European Green Deal and the EU Strategy for Sustainable and Circular Textiles are establishing a new legal framework based on circularity, digitalisation, and environmental responsibility. Regulations such as Extended Producer Responsibility (EPR), the Waste Directive, and the Ecodesign Regulation are driving the creation of a new industrial link focused on material recovery and valorisation. Textile waste managers—especially those from the social economy—play a key role in collection, reuse, repair, and recycling, enabling new circular business models. Catalonia generates 150,000–165,000 tonnes of textile waste annually, with only 11–12% collected separately today. EU and national goals require increasing selective collection to 50% by 2030 and 70% by 2035. Employment projections range from 826 new jobs in a pessimistic scenario to more than 2,500 in reuse, repair, and recycling activities.

	Thirty emerging professional profiles have been identified, including circularity technicians, upcycling designers, LCA analysts, 3D fashion designers, and environmental traceability specialists. Key recommendations include deploying a harmonized regulatory framework, expanding training in circularity and eco-design, investing in local reuse and recycling infrastructure, fostering collaboration across the value chain, and raising citizen awareness for responsible consumption.
Insights & Learnings	The double transition of the industry will create new professional profiles that can facilitate change in processes. New soft skills will be needed. Impact measurement knowledge will be valuable. Alignment of the evolution of professional profiles with the changes in the industry will contribute to the resilience of SMEs.
Future Scope and Recommendations for Including the Workshop as Learning Material	Develop training sessions for each professional profile identified Select target groups of professionals who best adapt to the new professional profile identified.
If Recommendations for Interactive Learning Objects, please add	
Please, share documentation: Images and visualisations Links to videos, to presentations, process documentation (miro board, Trello board etc.) Pictures from workshops of the pilot in the Share folder (LINK) Pictures from the workshop in new professional profiles (LINK) Presentation (LINK) Eco-design Workshop Climate Law Workshop Greenclaims Workshop	

Printed electronics in textile	
8.9. and 17.9. 2025, Prinlab at Oulu University of Applied Sciences	
Contact Person from Pilot Team (Name and contact info)	Liisa Ronkainen, liisa.ronkainen@oamk.fi Harri Määttä, harri.maatta@oamk.fi
Describe the workshop and the workshop format (max 500 characters)	Workshop I content: Introduction to printed electronics in textiles Overview of printed circuits and functional materials Applications in wearable technology

	Integration of sensors into smart clothing (e.g., temperature or motion tracking) Sustainability in smart textiles / Durability and washability of printed circuits Presentation of the project's pilot plan: the Snow Queen costume for a dance performance Workshop II content: Printing techniques for flexible electronics / Energy-efficient and low-waste manufacturing processes Designing printed circuits for textiles Selection of sustainable textile base materials Printing tests on textiles and various materials Participants could bring their own textiles to the first workshop, which would be prepared between sessions. On the second workshop, they could test printing on the textiles they brought.
Experimentation / Investigation conducted	Silver tested as electric conductor in different textiles.
Crafts techniques applied	-
Technologies applied	Printed electronics introduced and silver tested as conductor in different fabrics.
Business Models tested	-
Sustainability Measures applied	Sustainability of printed electronics vs. Traditional electronics discusses.
Number of Participants	8
Stakeholder group(s): who participated?	Stakeholds from textile industry, textile repair industry, performing arts costume professionals (theater), crafts artists, dance performance costume entrepreneurs.
Preliminary Results	2 participants from the workshop have expressed interest to being a part of pilot 3, part 3 research and testing.
Insights & Learnings	In everyday clothing electronics still need a power source, so apart from footwear, it is still challenging to integrate electronics into clothing due to the sizeable power source. The power source and circuits also cannot be washed; therefore, they have to be easily removable. In performance costumes, this is not such an issue as useability is not the most important criteria.
Future Scope and Recommendations for Including the Workshop as Learning Material	The workshop material and content was used as a base to create the projects micro credential curriculum.
If Recommendations for Interactive Learning Objects, please add	
Please, share documentation: Pilot 2 image selection Oamk The file contains photos and videos of workshops, the making of the garment, the technologies tested and the final SunWind performance.	

WORKSHOP - ADDITIVE MANUFACTURING AND 3D PRINTING ON FLEXIBLE MATERIALS	
10.11.2025, Iasi/Romania	
Contact Person from Pilot Team (Name and contact info)	Dorin Ionesi (savin-dorin.ionesi@academic.tuiasi.ro) Radu Firicel (radu.firicel@student.tuiasi.ro)
Describe the workshop and the workshop format (max 500 characters)	Using additive technologies, the onsite workshop explored 3D printing on textiles as a way to translate traditional symbols into contemporary creations, revitalising crafts through a modern and innovative visual language. It enabled hands-on experimentation with materials and techniques, encouraging creativity and a dialogue between tradition and innovation.
Experimentation / Investigation conducted	Participants investigated the interaction between various textile substrates (e.g., cotton, linen, synthetic fabrics) and 3D printing materials. They explored optimal adhesion techniques, print settings, and design constraints for successful integration. Additionally, traditional Romanian patterns were reinterpreted using parametric design tools to evaluate their adaptability to additive manufacturing.
Crafts techniques applied	Traditional Romanian textile motifs and embroidery patterns were analysed and stylised for digital reinterpretation. Participants applied techniques inspired by weaving, stitching, and ornamental symmetry, translating them into 3D printable forms. The workshop emphasised the aesthetic and symbolic value of folk designs, integrating them with contemporary fabrication methods to create hybrid artifacts that honor craft heritage while embracing innovation.
Technologies applied	The workshop utilised FDM (Fused Deposition Modeling) 3D printing technology to apply thermoplastic materials (PLA) directly onto textile surfaces. CAD software was used for designing patterns inspired by traditional motifs, while slicing software optimised print settings for textile compatibility. Participants also explored parametric design tools to adapt folk symbols into printable geometries, and tested various printer bed temperatures and nozzle settings to ensure adhesion and material flexibility.
Business Models tested	NEW BUSINESS MODEL for Heritage and Crafts
Sustainability Measures applied	The workshop promoted sustainability by using biodegradable or recyclable 3D printing materials (PLA). Textile substrates were sourced from fabric scraps and upcycled garments to reduce waste.
Number of Participants	23
Stakeholder group(s): who participated?	Participants included students of TUIASI from three study programs: Industrial Engineering, Engineering and Management, and Industrial Design. Their diverse academic backgrounds facilitated an interdisciplinary approach, combining technical knowledge, strategic thinking, and creative design in the exploration of 3D printing on textiles.
Preliminary Results	During the workshop, various textile surfaces were embellished with 3D-printed traditional Romanian motifs, including geometric patterns, solar symbols, and stylised flora. These were digitally redesigned and printed using thermoplastics onto cotton, linen, and polyester fabrics. The resulting hybrid materials combined the tactile qualities of textiles with the relief and precision of additive manufacturing, creating contemporary surfaces that celebrate cultural heritage through innovation.
Insights & Learnings	Participants gained a deeper understanding of how traditional cultural symbols can be reinterpreted through digital tools and additive manufacturing. The hands-on process highlighted the importance of material compatibility, surface texture, and design adaptability.

Future Scope and Recommendations for Including the Workshop as a Learning Material	The workshop demonstrates strong potential as a multidisciplinary learning module that bridges engineering, design, and cultural studies. It is recommended that this format be integrated into curricula focused on sustainable design, digital fabrication, and heritage innovation. Future iterations could include more advanced modelling techniques, collaborations with artisans, and real-life product development challenges. The approach encourages experiential learning, critical thinking, and creative engagement with both tradition and technology.
If Recommendations for Interactive Learning Objects, please add	Develop digital tools such as editable libraries of traditional motifs, short video tutorials, and virtual simulations of 3D printing on textiles. These resources can support hands-on learning, enhance understanding of material behaviour, and make the workshop content accessible in blended or remote learning formats.

MDD4AT & CLIMATHON	
DATE/VENUE	
Contact Person from Pilot Team (Name and contact info)	Pia Hansen PIHA@VIA.DK
Describe the workshop and the workshop format (max 500 characters)	Climathon is a global annual event (https://www.climate-kic.org/who-we-are/about-climate-kic/) focusing on various initiatives to reduce human impact on the environment. In the Ecosystem of the central region of Denmark, the event was hosted by Bæredygtig Herning in 2025. The local CRAFT-IT team provided a MDD4AT workshop for invited students based on materials from the Interreg project SORTEX (https://www.sortexprojekt.org/) The workshop was structured around an initial presentation by Line Boss from Danish fast fashion company Bestseller followed by a short introduction to the complexities relating to recycling of post-consumer waste, which is one of the focus areas in SORTEX. Next step was an introduction to material driven design as one of the core elements in the Danish pilot, iteration 2. The model had been adjusted to fit the event and a Danish audience of students. The students were divided into groups (4-5) and could choose materials among huge piles of post-consumer waste, provided by the Danish sorting company, NewRetex (https://newretex.com/). The groups then employed the MDD4AT model and explored, envisioned and encapsulated the potential uses of the chosen materials. The proposals from the student groups were presented in plenum and evaluated by a judging committee with representatives from Sortex Herning Municipality, and the Business Council of Ikast/Brande (https://www.erhvervsraadet.dk/).
Experimentation / Investigation conducted	The model MDD4AT is developed based on previous investigations and experimentations conducted within the Innovation fund supported research project READY (https://ldcluster.com/en/projects/ready/) and CRAFT-IT4SD The participating students employed the model to investigate potential uses of post-consumer waste
Crafts techniques applied	Nonspecific
Technologies applied	The workshop was analogue and did not employ any specific technologies due to location and logistic circumstances
Business Models tested	-
Sustainability Measures applied	Nonspecific, however exploring the use of post-consumer waste bears the potential of contributing to keep resources as high as possible in the waste

	hierarchy as defined by the EU (https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en)
Number of Participants	112 students
Stakeholder group(s): who participated?	Sortex Bæredygtig Herning Business Council Ikast/Brandeb NewRetex Bestseller Herning Municipality
Preliminary Results	Findings indicate that addressing materials in the front end of the design process and as a tool to idea generation enrich students' perceptions on the value of resources.
Insights & Learnings	The MDD4AT is still being evaluated and adjusted according to participant feedback. The model is still perceived as complex by some students consequently, we are now developing supporting tools to ease the process.
Future Scope and Recommendations for Including the Workshop as Learning Material	The workshop is highly relevant for clothing and textile design education as well commercially. However, it is also applicable to other lines of design development using tangible resources.
If Recommendations for Interactive Learning Objects, please add	The workshop is applicable to evaluate resources in various contexts, e.g. fish skin (Oulo) or 3D printing (Tuasi)

MDD4AT & EXPLORE THE INDUSTRY	
DATE/VENUE	
Contact Person from Pilot Team (Name and contact info)	Anne Louise Bang ANLB@VIA.DK Malene Pilgaard Harsaae MHR@VIA.DK
Describe the workshop and the workshop format (max 500 characters)	To disseminate the model, MDD4AT, CRAFT-IT researchers have offered to execute material driven workshops for fashion design students at their 6 th semester BA level. The workshops are situated in the curricula defined design project Explore the Industry, where the fashion students, one Danish and one international class, individually develop a menswear collection. The workshop lasts a full teaching day, corresponding to 7 lessons. Following two weeks of introduction to menswear and menswear products, the workshop is planned to be executed at the beginning of the students' design process. Before the workshop, the students are introduced to material driven design (Karana et al, 2015; Ribul et al, 2021), MDD4AT, and the Sensorial Wheel (Hartvigsen & Hasling, 2022). The latter is a tool supporting the exploring phase of MDD4AT. The entrance point for the workshop is material found by the students (e.g. virgin, deadstock) or provided by the lecturers. Either way the students follow the phases of the MDD4AT model; explore, envision, and encapsulate to define the operational aesthetic space the material properties allow for. In the first phase the students explore the sensorial aspects of the material including tactility, look, smell, sound. In
Experimentation / Investigation conducted	The model MDD4AT is developed based on previous investigations and experimentations conducted within the Innovation fund supported research project READY (https://ldcluster.com/en/projects/ready/) and CRAFT-IT4SD

	The participating students employed the model to investigate potential uses of post-consumer waste
Crafts techniques applied	Nonspecific
Technologies applied	The workshop was analogue and did not employ any specific technologies due to location and logistic circumstances
Business Models tested	-
Sustainability Measures applied	Nonspecific, however exploring the use of post-consumer waste bears the potential of contributing to keep resources as high as possible in the waste hierarchy as defined by the EU (https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en)
Number of Participants	112 students
Stakeholder group(s) who participated?	Sortex Bæredygtig Herning Business Council Ikast/Brande NewRetex Bestseller Herning Municipality
Preliminary Results	Findings indicate that addressing materials in the front end of the design process and as a tool to idea generation enrich students' perceptions on the value of resources. The MDD4AT is still being evaluated and adjusted according to participant feedback. The model is still perceived as complex by some students consequently, we are now developing supporting tools to ease the process
Insights & Learnings	Spring 2026
Future Scope and Recommendations for Including the Workshop as Learning Material	The workshop is highly relevant for clothing and textile design education as well commercially. However, it is also applicable to other lines of design development using tangible resources.
If Recommendations for Interactive Learning Objects, please add	The workshop is applicable to evaluate resources in various contexts, e.g. fish skin (Oulo) or 3D printing (Tuasi)
Please, share documentation: Workshop is still in planning process , links will be added later	

WORKSHOP - Measuring Climate Impact in Fashion: A CRAFT-IT4SD Training Webinar	
27.01.2026, online	
Contact Person from Pilot Team (Name and contact info)	Annu Markkula (annu.markkula(at)vtt.fi)
Describe the workshop and the workshop format (max 500 characters)	The interactive webinar, aimed at fashion practitioners, Measuring Climate Impact in Fashion, included a short life cycle assessment (LCA) methodology training to help participants learn how LCA measures environmental impacts in fashion, a fashion climate impact quiz, and the presentation of the results of case studies on selected circular fashion business models can reduce the climate footprint of the sector as well as a Q&A session for the participants.
	Not applicable

Experimentation / Investigation conducted	
Crafts techniques applied	Not applicable
Technologies applied	Not applicable
Business Models tested	Four circular fashion business model climate impact assessment case studies presented
Sustainability Measures applied	The workshop promoted knowledge of life cycle assessment (LCA) methodology in environmental impact assessments and how the LCA results should be interpreted and utilised when trying to lower the greenhouse gas (GHG) emissions in the fashion sector
Number of Participants	27 of which 4 facilitators and 23 external participants
Stakeholder group(s): who participated?	Participants included companies, industry associations, international organisations, think tanks/NGOs advancing sustainable fashion and research institutions from over 10 European countries.
Preliminary Results	See section “Sustainability Measures applied”
Insights & Learnings	See section “Sustainability Measures applied” and “Future Scope and Recommendations for Including the Workshop as Learning Material”
Future Scope and Recommendations for Including the Workshop as Learning Material	8 of the 23 participants (34,8% response rate) provided feedback via a survey sent after the webinar. The feedback was positive, but leaves room for further improvements, despite the average EVS score being 68, while for all organisations the same score is 74 (out of 100). No low scores were given, however; all were 4 or 5 on a scale of 1-5, where 5 is the highest. Verbal feedback: • <i>The interactive quiz and the dispelling of some assumptions [was good].</i> • <i>Amazing.</i> • <i>It helped me realize that my notions about the environmental footprint of basic textile items do not correspond to reality.</i> • <i>I liked the interactivity provided by the QR codes, but I missed some interaction within the group.</i> • <i>Super informative, brief and lively presented.</i> • <i>Surprise effect of LCA data. Really made me to think LCA a new way.</i> Screenshots of the webinar are included in a separate file.
If Recommendations for Interactive Learning Objects, please add	See above “Future Scope and Recommendations for Including the Workshop as Learning Material”: Some interaction within the group could be improved.

Contact Person from Pilot Team (Name and contact info)	Liisa Ronkainen, liisa.ronkainen@oamk.fi
Describe the workshop and the workshop format (max 500 characters)	The workshop offered craft, textile, design, and fashion professionals a practical introduction to designing and producing performance costumes in line with sustainable development principles. Content included case examples, a presentation, and expert-led discussion. In the applied section, participants individually or in pairs designed a performance outfit for a selected artist, producing feasible and well-developed concepts.

Experimentation / Investigation conducted	The workshop explored how sustainable principles can be applied to performance costume design. Participants investigated the specific functional and aesthetic requirements of stage costumes, and how recycled and reused materials can be integrated into design processes. The hands-on task enabled experimentation with concept development for different artist identities.
Crafts techniques applied	Sewing, garment construction, knitting, textile manipulation, and concept-based costume design.
Technologies applied	Digital presentation materials (PDF), visual references, and design planning tools. No advanced or digital fabrication technologies were applied.
Business Models tested	Sustainable fashion practices, including reuse-based design, small-scale production, and artist-focused custom costume design. The session also reflected entrepreneurial approaches within creative and circular fashion contexts.
Sustainability Measures applied	Use and promotion of recycled and reused materials, emphasis on circular design principles, durability, and responsible production methods. Awareness of reducing material waste and extending product life cycles was central.
Number of Participants	16
Stakeholder group(s): who participated?	Participants included OSAO Textile and Fashion students and teachers, workshop leaders (entrepreneur-artists), OAMK representatives (project specialist and teacher), a costumier from Oulu Theatre, and a textile entrepreneur from Kooma Design.
Preliminary Results	Participants produced diverse and feasible costume concepts tailored to selected artists. Outputs demonstrated strong creative engagement and the ability to apply sustainability principles in design thinking.
Insights & Learnings	Participants gained understanding of the specific demands of performance costumes and how sustainability can be integrated into creative processes. The combination of expert input, case examples, and practical work proved effective in supporting learning and idea generation.
Future Scope and Recommendations for Including the Workshop as Learning Material	The workshop format is highly suitable for integration into design and fashion education. It is recommended to maintain a balance between theoretical input and hands-on design work. Expanding the workshop with prototyping or material experimentation would further strengthen learning outcomes.
If Recommendations for Interactive Learning Objects, please add	Development of guided design exercises, digital templates for costume planning, and case-based learning materials. Interactive group critiques and iterative design tasks are recommended to enhance engagement and peer learning.
Please, share documentation: The file contains photos of the workshops, the garment, the technologies tested and the final Maija Kauhanen performance.	

04.05.2026, Iasi/Romania	
Contact Person from Pilot Team (Name and contact info)	Dorin Ionesi (savin-dorin.ionesi@academic.tuiasi.ro) Radu Firicel (radu.firicel@student.tuiasi.ro) Aura Mihai (aura.mihai@academic.tuiasi.ro)
Describe the workshop and the workshop format (max 500 characters)	The workshop introduced participants to the application of Design Thinking, Circular Fashion principles, and Additive Manufacturing technologies in the development of sustainable fashion products. Through presentations, collaborative design exercises, practical demonstrations, and group discussions, participants explored how 3D printing can support the creation of sustainable capsule collections. The reference study case was the outfits of EGG collection realised in the 1st iteration of the pilot and presented at RCW2025 The workshop combined human-centred design approaches with digital fabrication technologies, encouraging participants to develop innovative fashion concepts that address environmental, social, and economic sustainability challenges.
Experimentation / Investigation conducted	Participants explored the complete design and production process of a sustainable capsule collection. Activities included: • Applying Design Thinking methodologies (Empathise, Define, Ideate, Prototype, Test) to fashion product development. • Investigating circular fashion principles, including Design for Disassembly (DfD), durability, modularity, and life-cycle thinking. • Evaluating the role of additive manufacturing in reducing waste and supporting on-demand production. • Designing concepts for sustainable fashion products and accessories using digital tools. • Observing the direct 3D printing of decorative and functional elements onto textile substrates. • Analysing material compatibility, production constraints, and sustainability benefits associated with additive manufacturing technologies.
Crafts techniques applied	Traditional Romanian textile motifs and decorative patterns were used as inspiration for the design process. Participants explored how elements of cultural heritage can be translated into contemporary fashion products through digital modelling and additive manufacturing. The workshop promoted the preservation of traditional craft values while encouraging innovative reinterpretations through sustainable design approaches.
Technologies applied	The workshop employed a combination of digital design and manufacturing technologies, including: • CAD modelling software for concept development and product design • Design Thinking tools such as empathy mapping, persona development, and ideation exercises • FDM/FFF 3D printing technologies for rapid prototyping and direct printing on textile materials • Slicing software and digital fabrication workflows • Sustainable design methodologies supporting circular product development

Business Models tested	Participants explored how additive manufacturing supports innovative business models based on: • On-demand production • Product customisation and personalisation • Reduced inventory and overproduction • Localised manufacturing • Circular economy principles and sustainable value creation
Sustainability Measures applied	Sustainability was embedded throughout the workshop through: • Application of Circular Fashion principles. • Design for Disassembly and Design for Durability strategies. • Promotion of modular and adaptable fashion concepts. • Reduction of material waste through additive manufacturing. • Exploration of recyclable, renewable, and biodegradable materials. • Consideration of product life-cycle impacts during the design process. • Encouragement of local production and responsible consumption models.
Number of Participants	33
Stakeholder group(s): who participated?	Students, researchers, and academic staff from engineering and design-related study programs.
Preliminary Results	Participants developed and evaluated sustainable capsule collection concepts integrating circular design principles and additive manufacturing technologies. Several teams proposed fashion accessories and garment enhancements incorporating 3D printed components inspired by traditional Romanian motifs. Practical demonstrations successfully illustrated the direct application of 3D printing onto textile substrates and highlighted opportunities for customisation, functionality, and sustainable production.
Insights & Learnings	The workshop demonstrated that Design Thinking, Circular Fashion principles, and Additive Manufacturing technologies can be successfully integrated into a coherent framework for sustainable fashion innovation. By combining human-centred design methodologies with digital fabrication tools, participants experienced a complete innovation process that connected user needs, cultural heritage, sustainability objectives, and technological possibilities. One of the most important insights gained during the workshop was the value of the Design Thinking approach in addressing complex sustainability challenges within the fashion industry. Through the stages of empathy, problem definition, ideation, prototyping, and testing, participants learned how fashion products can be designed not only from an aesthetic perspective but also from the perspective of user needs, environmental impact, durability, and long-term value creation. The workshop encouraged participants to move beyond traditional product-oriented thinking and adopt a broader systems perspective that considers the entire lifecycle of a fashion product. Therefore, the activities focused on developing a sustainable capsule collection, allowing participants to understand how a limited number of carefully designed, versatile products can contribute to more responsible consumption patterns. Through collaborative design exercises, participants explored how capsule collections can reduce overproduction, encourage product longevity, and promote conscious purchasing decisions.

	Discussions highlighted the importance of designing multifunctional, adaptable, and timeless products that remain relevant beyond short-lived fashion trends. A significant learning outcome concerned the application of circular fashion principles. Participants explored concepts such as Design for Disassembly (DfD), Design for Durability (DfD), modularity, repairability, and life-cycle thinking. They recognised that sustainability should be considered from the earliest design stages and that design decisions directly influence the environmental performance of products throughout their entire lifecycle. The workshop demonstrated how circular design strategies can minimise waste, facilitate repair and reuse, and support future recycling or remanufacturing processes. The practical demonstration of 3D printing on textile materials provided valuable insights into the opportunities and limitations of additive manufacturing within fashion and textile applications. Participants observed the complete workflow involved in direct printing onto textile substrates, including digital design preparation, slicing, machine setup, substrate fixation, printing, and evaluation of the final results. They learned that successful integration of 3D-printed elements depends on a careful balance among material properties, process parameters, textile structure, and intended functionality. Particular attention was given to the use of Romanian folk motifs as a source of inspiration for contemporary sustainable fashion design. Participants explored how traditional decorative elements, geometric patterns, and symbolic motifs originating from Romanian textile heritage can be digitally reinterpreted and transformed into three-dimensional structures suitable for additive manufacturing. This process illustrated how digital technologies can contribute to the preservation, revitalisation, and contemporary reinterpretation of intangible cultural heritage. The direct printing of Romanian-inspired geometric patterns onto textile substrates demonstrated that additive manufacturing can create new forms of interaction between traditional craftsmanship and modern production technologies. Participants observed how culturally significant motifs can be transformed into customised decorative elements, functional reinforcements, textured surfaces, or modular components integrated directly into garments and accessories. This approach highlighted the potential of digital fabrication not only as a manufacturing tool but also as a medium for cultural storytelling and heritage valorisation. Another important insight concerned the role of rapid prototyping in accelerating innovation processes. Participants experienced how digital models can be quickly modified, tested, and improved without costly tooling or excessive material use. This capability supports experimentation, iterative design development, and continuous improvement, enabling designers to validate concepts efficiently before moving toward production. The workshop also demonstrated the potential of additive manufacturing to support local and on-demand production models. Participants recognised that 3D printing can reduce inventory requirements, minimise material waste, shorten supply chains, and facilitate the production of highly customised products tailored to individual user preferences. These characteristics align closely with the objectives of sustainable and circular fashion systems. From an educational perspective, the workshop fostered interdisciplinary collaboration between participants from different academic backgrounds, including engineering, design, and management. Play role and team-based activities encouraged communication, creativity, and collaborative problem-solving while
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	exposing participants to multiple perspectives on sustainability challenges and opportunities for innovation. Overall, participants developed a deeper understanding of how Design Thinking methodologies, Circular Fashion strategies, and Additive Manufacturing technologies can work together to generate innovative, sustainable, and culturally meaningful fashion solutions. The workshop demonstrated that combining human-centred design approaches with digital fabrication and traditional craft heritage creates significant opportunities for developing future fashion products that are environmentally responsible, economically viable, technologically advanced, and culturally relevant.
Future Scope and Recommendations for Including the Workshop as a Learning Material	• Advanced sustainable material experimentation, including new solutions for multi-material and flexible-material 3D printing • Team working and play role simulations. Collaboration with fashion designers, artisans, and industry stakeholders • Development of sustainable capsule collections
If Recommendations for Interactive Learning Objects, please add	• Digital libraries of traditional Romanian motifs • Virtual prototyping exercises • Video tutorials demonstrating sustainable design workflows • Online collaborative capsule collection design challenges

WORKSHOP - EMPATHIC DESIGN WORKSHOP FOR STUDENTS	
20.04.2026, Herning	
Contact Person from Pilot Team (Name and contact info)	Tiia Maria Jaakkola (tjaa@via.dk) Anne Lise Opstad (ano@via.dk) Egle Klimaitis (ekli@via.dk)
Describe the workshop and the workshop format (max 500 characters)	The workshop introduced empathic design methods with the focus on the field of fashion design. Participants designed their own mini research plans based on an exploration of how empathic design methods can create value in fashion design. The workshop was wrapped up with group reflection led by the facilitator.

Experimentation / Investigation conducted	Students practiced the newly learned knowledge by building their own mini research plan based on example cases of four personas given to them – inviting the students to “step into someone’s world”. The developed personas embody empathic design by representing real emotional, physical, and contextual needs. The students wrote a short design task and selected methods, explored how and why these methods would be relevant to be chosen when designing with the selected persona. The focus was on understanding how empathic design employs structured methods—such as simulators, empathic probes, and role-play—to explore users’ emotions, challenges, routines, and lived experiences that are often difficult to articulate verbally for end-users. By applying these methods, the investigation demonstrated that empathy in design is not based on assumptions or guesswork, but on systematic and intentional inquiry. The investigation supported an understanding of empathy as a part of the design process, enabling designers to create meaningful and relevant products for a clearly defined target group. Emphasis was placed on exploring user experiences before moving toward solution development, highlighting that effective design begins with careful investigation rather than predefined solutions.
Crafts techniques applied	While not explicitly a crafts-focused workshop, the empathic design for fashion designers has an overarching goal of instead of simply creating products or following trends, the designer becoming connector—bringing people, materials, and systems together.
Technologies applied	The workshop explored in a presentation format a range of technologies and their applications. It highlighted how virtual reality (VR) and augmented reality (AR) can support role-playing activities and be used in creating simulators. The simulators can be digital environments, such as VR or AR, which recreate specific experiences. Examples include simulations designed to reflect the realities of people living with dementia or people with diminished dexterity. Within empathic design, immersive research methods can be enhanced through the use of digital tools in various ways. Additionally, the potential of the CLO3D virtual prototyping tool was discussed. This tool can be used to communicate design processes to end users, support workshop activities, and create empathic probes.
Business Models tested	Tested business model: The donut economy - model The students gained knowledge and competencies that can be directly applied to the development of new business models grounded in the Doughnut Economy framework. The workshop enabled students to better understand users’ needs, societal challenges, and environmental constraints, which align closely with the core principles of the Doughnut Economy. The Doughnut Economy model was developed by the British economist Kate Raworth. Its fundamental idea is to create an economic system that meets human needs while respecting the environmental limits of the planet. Students reflected on how empathic design methods can help to design better products that serve the functional needs of the end-user. This approach encourages the creation of business models that do not focus only on profit maximization, but instead generate value for people, society, and the planet.

Sustainability Measures applied	The workshop explored how empathic design can support sustainability indirectly—through designing with people instead of for them. The discussion was focused on how the future of fashion belongs not to those who design <i>for</i> people, but to those who design <i>with</i> them co-creating solutions that respond to emotional, social, and environmental needs. In this way, empathy becomes both the foundation and the future of sustainable fashion, rooted in compassion, responsibility, and shared progress. The reflection supported by the donut economy model supported this focus.
Number of Participants	8
Stakeholder group(s): who participated?	Participants were Danish and international students from the Pattern Design & Fashion Design specializations within the AP Design & Business program at VIA University College, Denmark (equivalent to BA 4th semester). The mix of backgrounds fostered an interdisciplinary dialogue between craft, design, fashion industry, and business.
Preliminary Results	All students successfully applied the methods in their mini research plans, showing a clear understanding of how empathic design translates into fashion design. Several students quickly demonstrated an understanding of how the methods could be applied directly to their own projects. Discussions and reflections ended with highlighting how the future designer's role can be shifting from making things to restoring balance between aesthetics, ethics, and the environment – with the focus on donut economy – model.
Insights & Learnings	The session demonstrated that even a short introduction to empathic methods can generate rich discussions around user-centered value creation, and design meaning in fashion. Hands-on engagement with empathic tools was crucial in making the approach tangible, helping students understand its relevance and inspiring immediate application in real-world fashion design projects.
Future Scope and Recommendations for Including the Workshop as Learning Material	This workshop shows strong potential as a recurring or modular component in interdisciplinary design and business education. Future iterations should allow for more time, deeper experimentation, and individual exploration between sessions. Follow-up workshops could include developing own empathic probes, building own empathic simulators, and reflections on real-world cases.
If Recommendations for Interactive Learning Objects, please add	Consider creating or including physical samples of empathic probes and simulators to the workshop, helping the participants to have hands-on testing possibility of the methods introduced.

WORKSHOP - Future Sustainable Fashion Business Models: A CRAFT-IT4SD Training Workshop	
09.02.2026, online	
Contact Person from Pilot Team (Name and contact info)	Annu Markkula (annu.markkula@vtt.fi) Fred Saarinen (fred.saarinen@fashioninnovation.center)
Describe the workshop and the workshop format (max 500 characters)	The training workshop on Future Sustainable Fashion Business Models for fashion sector, included a training session on sufficiency-based business models in sustainable fashion, and presented six business model canvas drafts that the participants were able give feedback using Miro.
Experimentation / Investigation conducted	The workshop feedback session collected data on - understanding the strengths and weaknesses of these business models and - assessing the potential of these models and develop them further.
Crafts techniques applied	Not applicable
Technologies applied	Not applicable
Business Models tested	In total six business models were tested: - Repair Café - Commercially Operated - CraftedForMe – When Craft Meets Microfactory Innovation - Fashion Declutter – Externalising Wardrobe Clean-Up - Curated Rewear – Second-Hand Style, Curated and Searchable. Fast. - Crafting Virtual Style - Style Crafted in Pixels, Made on Demand. - Clothing Repair Chain – Repair Easily Accessible
Sustainability Measures applied	The workshop promoted knowledge of sufficiency-based business models and introduced six business model drafts to inspire people on these types of business models.
Number of Participants	26 of which 21 participants + 5 organisers
Stakeholder group(s): who participated?	Participants included representatives from SMEs (fashion brands and consultancies); Fashion-focused networks and knowledge platforms; Higher education institutes (Universities and Universities of Applied Sciences; Research and Technology organisations; and Fashion industry associations.
Preliminary Results	Based on the feedback, participants recognised that some business models would be good to be mixed and matched or were missing one crucial aspect to make those viable. On the other hand, some models got more divided feedback (business model 5. Crafting Virtual Style - Style Crafted in Pixels, Made on Demand).
Insights & Learnings	See section “Sustainability Measures applied” and “Future Scope and Recommendations for Including the Workshop as Learning Material”
Future Scope and Recommendations for Including the Workshop as Learning Material	As the workshop feedback below shows, the workshop concept worked well, enabling participants to learn about sufficiency-oriented business models and to have hands-on experience on how business model ideas can be developed further in an online environment. The same concept could also be applied in offline context. The feedback survey was also utilised to collect further feedback on the business models are not all participants were able to comment all the models in the workshop. It is recommended to have this type of feedback element when implementing this kind of workshop.

WORKSHOP - Future Sustainable Fashion Business Models: A CRAFT-IT4SD Training Workshop	
09.02.2026, online	
Contact Person from Pilot Team (Name and contact info)	Annu Markkula (annu.markkula@vtt.fi) Fred Saarinen (fred.saarinen@fashioninnovation.center)
Describe the workshop and the workshop format (max 500 characters)	The training workshop on Future Sustainable Fashion Business Models for fashion sector, included a training session on sufficiency-based business models in sustainable fashion, and presented six business model canvas drafts that the participants were able give feedback using Miro.
Experimentation / Investigation conducted	The workshop feedback session collected data on - understanding the strengths and weaknesses of these business models and - assessing the potential of these models and develop them further.
Crafts techniques applied	Not applicable
Technologies applied	Not applicable
Business Models tested	In total six business models were tested: - Repair Café - Commercially Operated - CraftedForMe – When Craft Meets Microfactory Innovation - Fashion Declutter – Externalising Wardrobe Clean-Up - Curated Rewear – Second-Hand Style, Curated and Searchable. Fast. - Crafting Virtual Style - Style Crafted in Pixels, Made on Demand. - Clothing Repair Chain – Repair Easily Accessible
Sustainability Measures applied	The workshop promoted knowledge of sufficiency-based business models and introduced six business model drafts to inspire people on these types of business models.
Number of Participants	26 of which 21 participants + 5 organisers
Stakeholder group(s): who participated?	Participants included representatives from SMEs (fashion brands and consultancies); Fashion-focused networks and knowledge platforms; Higher education institutes (Universities and Universities of Applied Sciences; Research and Technology organisations; and Fashion industry associations.
	5 out of 21 participants (23,8% response rate) provided feedback via a survey sent after the workshop. The respondents felt that the workshop had been worth their time (<i>average 4,25 on a scale of 1-5</i>). Regarding how viable the participants saw the presented business models (<i>on a scale of 1-6</i>), the Clothing repair chain received the highest score (<i>average 3,75</i>) while the Fashion Declutter received the lowest score (<i>average 2,6</i>). The other business models received average scores between 2,75 – 3. In the verbal feedback, the Clothing repair chain raised some concern that the chains could crowd out small independent providers and reduce service quality/personalisation. A suggested direction was rather to strengthen local repair ecosystems through apprenticeships/training, mapping of services, and targeted funding/support. The Fashion Declutter was commented to have potential in an app-led service using licensed/certified practitioners operating under a clear code of ethics. A key consideration was raised: the perceived acceptance varies by country/culture, so piloting and tailoring by market would be important.

WORKSHOP - Future Sustainable Fashion Business Models: A CRAFT-IT4SD Training Workshop	
09.02.2026, online	
Contact Person from Pilot Team (Name and contact info)	Annu Markkula (annu.markkula@vtt.fi) Fred Saarinen (fred.saarinen@fashioninnovation.center)
Describe the workshop and the workshop format (max 500 characters)	The training workshop on Future Sustainable Fashion Business Models for fashion sector, included a training session on sufficiency-based business models in sustainable fashion, and presented six business model canvas drafts that the participants were able give feedback using Miro.
Experimentation / Investigation conducted	The workshop feedback session collected data on - understanding the strengths and weaknesses of these business models and - assessing the potential of these models and develop them further.
Crafts techniques applied	Not applicable
Technologies applied	Not applicable
Business Models tested	In total six business models were tested: - Repair Café - Commercially Operated - CraftedForMe – When Craft Meets Microfactory Innovation - Fashion Declutter – Externalising Wardrobe Clean-Up - Curated Rewear – Second-Hand Style, Curated and Searchable. Fast. - Crafting Virtual Style - Style Crafted in Pixels, Made on Demand. - Clothing Repair Chain – Repair Easily Accessible
Sustainability Measures applied	The workshop promoted knowledge of sufficiency-based business models and introduced six business model drafts to inspire people on these types of business models.
Number of Participants	26 of which 21 participants + 5 organisers
Stakeholder group(s): who participated?	Participants included representatives from SMEs (fashion brands and consultancies); Fashion-focused networks and knowledge platforms; Higher education institutes (Universities and Universities of Applied Sciences; Research and Technology organisations; and Fashion industry associations.
	An open-ended consumer/self-assembly garment model supported by basic instructions was suggested as a business model, that was missing from the workshop. The sustainability rationale for this alternative would be that it enables better fit/size adjustments and potentially standardised, lower-cost production. Overall, the mixed methods used to collect feedback generated rich empirical material. The workshop structure is replicable in various other contexts and could be included in learning materials as an example of a business model evaluation workshop at an early stage of business model innovation.

WORKSHOP - Future Sustainable Fashion Business Models: A CRAFT-IT4SD Training Workshop	
24.04.2026 and 15.05.2026 — In-person mentoring workshops	
Contact Person from Pilot Team (Name and contact info)	Juliana Penagos Nigrinis Lidia Morcillo Jordana
Describe the workshop and the workshop format (max 500 characters)	In-person mentoring workshops organised by MODACC, with the support of external experts. The sessions combined expert-led presentations, applied mentoring, company case discussions, and networking activities focused on sustainability legislation and textile recycling. The workshops were designed to help fashion and textile companies translate regulatory and circularity challenges into actionable business decisions.
Experimentation / Investigation conducted	Participants explored how upcoming European regulations, textile waste mapping, and recycling systems impact current business operations. The workshops explored practical approaches for integrating circularity strategies, reducing dependency on virgin raw materials, and improving waste management and transformation processes within textile value chain.
Crafts techniques applied	Not applicable
Technologies applied	Not applicable
Business Models tested	Not tested but circular economy-oriented business approaches linked to textile recycling integration and regulatory adaptation were explored.
Sustainability Measures applied	Application of circular economy principles, textile waste reduction strategies, recycling integration, regulatory preparedness, resource efficiency, and sustainability-focused business adaptation measures aligned with upcoming European textile legislation.
Number of Participants	24 participants of which 2 organizers in each session
Stakeholder group(s): who participated?	Multiple stakeholder groups from the Catalan textile and fashion ecosystem, including: • Fashion brands (SMEs) • Manufacturers • Big enterprises • Designers • Students
Preliminary Results	Participants increased their understanding of upcoming sustainability regulations, circular textile systems, and practical recycling implementation strategies. The workshops generated active discussion around current barriers, regulatory adaptation, and opportunities for integrating circularity into existing business models.
Insights & Learnings	The sessions showed that companies require practical and operational guidance to respond to the rapid and constant changes of European textile legislation and circularity requirements. Participants highlighted the importance of collaboration, waste traceability, and realistic implementation pathways to accelerate sector transition.

ANNEX 2- CRAFT-IT4SD MICROCREDENTIALS

Title of the MICRO CREDENTIAL	Combining Craft with Digital Technologies for Sustainability in Garment Design and Consumer Approaches – part 1: The Thing from the Future
Development	Center for Applied Research in Textiles, Design & Circularity VIA University College
State of the Art	The Ecodesign Directive (Dimopoulou, 2025) mandates that fashion and textile companies implement, among others, a digital product passport to ensure regulatory compliance. Consequently, companies are advised to strengthen their digital infrastructures to align with this evolving regulatory landscape. More broadly, investment in digital technologies within the Cultural and Creative Industries (CCSI) has increased significantly (Khlystova et al., 2022), with generative artificial intelligence emerging as a transformative force in content creation (Lee, 2022). Similarly, Near Field Communication (NFC) tags, integrated with digital platforms, are expected to play a key role in these infrastructures. However, establishing such digital ecosystems to comply with the Ecodesign Directive requires the collaborative engagement of multiple stakeholders, including both companies and users. This shift underscores an urgent need for upskilling initiatives focused on developing and implementing digital infrastructures that are both user-centric and beneficial to businesses. Research suggests that scenario-building methodologies can foster speculative and strategic thinking, helping stakeholders navigate sustainability challenges and future consumer practices (Margolin, 2007; Dunne & Raby, 2013; Voros, 2022). One such approach is the imagination game <i>The Thing from the Future</i> (Candy & Watson, 2015), which generates speculative design concepts within structured yet open-ended frameworks. To support this, Design Thinking serves as an effective overarching methodology, capturing the essence of co-creation through its structured interplay of divergent and convergent thinking (Lawson, 2005; Liedtka & Ogilvie, 2011) as well as problem-solving and ideation to incorporate future scenarios (Harsaae & McElheron, 2015; Engholm, 2023). Additionally, design sprints offer a structured approach to guiding and accelerating design processes and co-creation (Knapp, 2016). In sum, co-creation, widely endorsed in European innovation policies, facilitates inclusive and socially robust innovation by fostering collaboration among diverse stakeholders under democratic principles (Ruess et al., 2023; Müller et al., 2021). In this micro-credential, we aim to address these emerging needs by equipping design and business students with the skills and knowledge necessary to navigate potentials and challenges of digital carriers (e.g. NFC technology and AI tools) in future business and design scenarios in the fashion industry. By integrating scenario-based learning, co-creation methodologies, and hands-on application of digital tools, the micro-credential fosters interdisciplinary collaboration and prepares students to contribute meaningfully to sustainable innovation within the industry.
Objective/Aim of the course	This micro-credential equips business and design students with the knowledge and skills to explore the potentials and challenges of digital carriers (such as NFC, AI tools, and biometric methods) in future business and design scenarios. Students will develop innovative solutions that enhance user interaction and engagement with micro-companies, bridging technology and human-centred design.
Prerequisites for users to start the course	To start this course, learners generally need to have some foundational knowledge and skills in the following areas:

	- Graphic software, e.g. Adobe package - Basic understanding of user involvement and co-creation - Basic understanding of design processes and design thinking					
Workload	Lectures	Seminars	Project	Laboratory Practice	Course assessments	Total
Teaching hours	8		4	6	4	
Individual study hours	4		8	6		
					Total hours	40
					Total ECTS	1,5
Learning outcomes- Knowledge and Skills	Knowledge: - Acquire knowledge on imagination games - Acquire knowledge on digital carriers based on AIDC technology - Acquire knowledge on creative use of AI engines - Acquire knowledge on biometric research tools Skills: - Scenario building - Develop contents for digital platforms in relation to AIDC technology - Apply AI engines to develop creative content, e.g. personas, photos, films - Perform and evaluate biometric tests with users in practice					
Syllabus	Conceptualization This course focuses on the development of concepts for a digital platform and testing concept solutions with users through biometric tools. The framework for the concept development is to combine craft and heritage with digital technologies for sustainable development. The course starts with scenario building using the tool 'The Thing from the Future' to envision potential future uses of digital carriers and platforms. From this, the course is structured into three constitutive elements: AI: introduction and experimenting - Introduction to AI engines - Introduction to AI tool, 'Rocket' - Understanding different AI engines and how to select among them - Developing personas, photos, films, products with AI tools AIDC technology: introduction and content creation - Introduction to AIDC technology (e.g. NFC) - Understanding how to use selected technology as digital carrier - Developing user relevant content for a digital platform Biometric research: introduction and testing - Introduction to biometric research tools (e.g. eye tracking, VR simulation, galvanic skin response) - Biometric testing with users - Analysing biometric test data					

Learning/teaching delivery formats	Incorporating innovative delivery formats can significantly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: ✓ Workshops ✓ Lectures ✓ Case studies ✓ Guidance ✓ Project Based Learning ✓ Group work ✓ Lab work
Type of assessment	Group presentations and demonstrations: students prepare and deliver presentations showcasing their developed concept and understanding of the practical exercises and the ability to communicate innovative ideas.
Pathway for a Successful Learner	EU legislation will require fashion and textile companies to develop new digital infrastructures, primarily to comply with the Ecodesign Directive by establishing a platform for the digital product passport. However, beyond regulatory compliance, the creation of such digital platforms and infrastructures also facilitates the emergence of new communication communities. This course offers students the opportunity to explore and develop content for digital platforms that enable companies to foster communities and promote specific crafts and cultural heritage. By doing so, businesses can integrate broader perspectives into their sustainable transition, enhancing both engagement and long-term value creation.
READINGS	Candy, S. & Watson, J. (2015) The Thing from the Future https://www.researchgate.net/publication/364677670_The_Thing_From_The_Future_Print-and-Play_Edition Dunne, A. & Raby, F. (2013) <i>Speculative Everything. Design, Fiction, and Social Dreaming</i>. THE MIT PRESS CAMBRIDGE, MASSACHUSETTS LONDON, ENGLAND. Chapter 1 Margolin, V. (2007) Design, the Future and the Human Spirit. <i>Design Issues: Volume 23, Number 3 Summer 2007</i> Voros, J. (2022) A primer on Futures Studies, foresight and the use of scenarios. <i>Last updated 2022-03-08. First published in prospect, the Foresight Bulletin, No. 6, December 2001, Swinburne University of Technology, Melbourne, Australia</i>
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Title of the MICRO CREDENTIAL	Combining Craft with Digital Technologies for Sustainability in Garment Design and Consumer Approaches – part 2: Material Driven Design
Development	Center for Applied Research in Textiles, Design & Circularity VIA University College
State of the Art	All artefacts are made of resources, extracted and processed somewhere and by someone. The exceeding of the planetary boundaries together with the Eco-design directive (EU ref) challenge the extraction of same increasing resource volumes as has been the normal for the fashion and textile industry. In 2020 the extraction and processing of polyester double the 2000 level (Changing Markets, 2021), and in 2000 synthetic fibres overtake the production of natural fibres.(ibid). The EU eco-design directive emphasizes among other aspects, an increased use of recycled materials. Recycled materials possess other properties and characteristics than well-known virgin materials and can thus be compared to new materials. New materials can have an adoption phase up to 20 years (Maine,2005, Karana et al, 2015). The combination of expected resource scarcity and implementation of new materials requires new approaches to the design and development of textile products. Material Driven design has been promoted has an approach to address material differently. Karana et al, 2015 introduced a material driven design model, MDD, to explore new materials with the intention of reducing the long adoption phase. This model addressed materials in a wide context and was thus not specifically designed for or aimed at clothing and textiles nor with a specific intention of contribution to the green transition of these industries. Ribul et al, 2021, introduced a material driven model for textile design, MDTD, focusing on “[...] materials science laboratory in order to establish new circular material-driven fabrication and finishing processes” (Ribul et al, 2021:14) and “decoupled from product development”. (Ibid, 2021:1) Both models contribute with significant aspects to exploring ad accessing materials, however they are complex to implement in a design process both from commercial settings (READY, 2024) and in

	educational contexts. With the two former mentioned models as point of departure, the model material driven design for apparel and textiles, MDD4AT, have been developed in the context of project READY (REF) to equip fashion and textiles designers, practitioners as well students, with tools to explore, evaluate and implement textiles with respect for resources and planetary boundaries. In the context of system thinking, Donella Meadows (2008) argues for addressing 12 different leverage points to contribute to system change that at the highest level contribute to a paradigm shift. The fashion and textile industries with their extensive use of resources and massive CO2 emissions need a system as well as a paradigm shift to have a justification in the future. MDD4AT provides a tool for clothing and textiles designer to establish material dialogues related to having “conversations with the material of a situation” (Schön, 1983) The model intends to contribute to a responsible use of future resources and to provide designers with tools that enable them with “response-ability” (Haraway, 2016:11). The MDD4AT is aimed at both professionals (practitioners) and students (novices) and focuses on exploring and evaluating textile materials in an open-minded, curious and constructive way. The thinking is that all resources are valuable, come from somewhere, and have been put into the world for a purpose and to be used. The material to be examined constitutes the point of departure for the material driven process (step 00, figure 1 left). The materials construction, fibre, knitted, woven, non-woven etc. is identified before the actual exploration begins. In step 01 the sensual and tactic characteristics and properties, including smell and sound, are explored (phase 01, figure 1). After this experiential exploration, the material is submitted for relevant laboratory testing for technical-based exploration. This phase is a divergent phase, exploring the material at hand without prejudice. Next phase (phase 02, figure 1), is a convergent phase, where the findings from phase 01 is analysed and the unique characteristic of the material is identified. Hereafter, it is about envisioning the expressions the material characteristics can contribute to create and the experiences, moods and feelings, the material can foster when used. Thus, phase 2 moves from a convergent to a divergent approach, starting with analysing and continuing to envisioning. In phase 3, the focus is on encapsulating corresponding to concretizing towards potential product types, context and situational use, and user. All insights and findings from phase 1-3 now constitute the framework for the designers’ operational aesthetic space and design development and prototyping is executed in phase 4. Depending on the characteristic of material intake and the results of the development phase, the process can be repeated. (Bang et al, 2025b)
Objective/Aim of the course	The objectives and aims of this course are to: • introduce participants/students to the relation between resource use and planetary boundaries • introduce participants/students to the theoretical aspects of a material driven design approach • introduce participants/students to the operational model Material Driven Design for Apparel and Textiles • enable participants/students to test and evaluate materials, either externally sourced or self-developed*. * It is recommended that the development of own materials is included, provided that relevant labs (knitting, weaving, printing, etc.) are available.
Prerequisites for users to start the course	To start this course, learners generally need to have some foundational knowledge and skills in the following areas: • Basic understanding of user involvement and co-creation • Basic understanding of design processes • Basis skills of product understanding

	Basic understanding of materials as a valuable and scarce resource					
Workload	Lectures	Seminars	Project	Laboratory Practice	Course assessments	Total
Teaching hours	8		4	4	4	
Individual study hours	4		8	6		
					Total hours	40
					Total ECTS	1,5
Learning outcomes- Knowledge and Skills	Knowledge: - Acquire knowledge about resource use and planetary consequences - Acquire knowledge on material driven design approaches - Acquire knowledge on design process tools from a material perspective - Acquire knowledge on biometric research tools Skills: - Apply material driven design, MDD4AT to develop a operational and aesthetic framework for product design - Explore, test, and evaluate material properties from aesthetic and functional perspective - Evaluate use potentials of materials including recycled, new, biobased, deadstock - Perform and evaluate biometric tests with users in practice					
Syllabus	Conceptualization This course focuses on the development of concepts for clothing and/or interior employing a material driven approach. The framework for the concept development is to combine craft and heritage with digital technologies for sustainable development. The course starts either with experiments in labs and developing prototypes or with exploring existing materials with scenario building using the tool 'The Thing from the Future' to envision potential future uses of digital carriers and platforms. From this, the course is structured into three constitutive elements: MDD4AT: introduction and experimenting - Introduction to the model MDD4AT - Testing a variety of materials using the MDD4AT model - Understanding different AI engines and how to select among them - Developing personas, photos, films, products with AI tools Lab work: introduction and prototyping - Introduction to experimenting in selected labs (knitting, weaving, printing) - Introduction to use of selected technologies - Developing materials for testing with users Biometric research: introduction and testing - Introduction to biometric research tools (e.g. eye tracking, VR simulation, galvanic skin response) - Biometric testing with users - Analysing biometric test data					
Learning/teaching delivery formats	Incorporating innovative delivery formats can significantly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are:					

	✓ Workshops ✓ Lectures ✓ Case studies ✓ Guidance ✓ Project Based Learning ✓ Group work ✓ Lab work
Type of assessment	Group presentations and demonstrations: students prepare and deliver presentations showcasing their developed concept and understanding of the practical exercises and the ability to communicate innovative ideas.
Pathway for a Successful Learner	EU legislation will require fashion and textile companies to develop new digital infrastructures, primarily to comply with the Ecodesign Directive by establishing a platform for the digital product passport . However, beyond regulatory compliance, the creation of such digital platforms and infrastructures also facilitates the emergence of new communication communities . This course offers students the opportunity to explore and develop content for digital platforms that enable companies to foster communities and promote specific crafts and cultural heritage. By doing so, businesses can integrate broader perspectives into their sustainable transition , enhancing both engagement and long-term value creation.
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	Ribul, M.; Goldsworthy, K.; Collet, C. (2021) Material-Driven Textile Design (MDTD): A Methodology for Designing Circular Material-Driven Fabrication and Finishing Processes in the Materials Science Laboratory. <i>Sustainability</i> 2021, 13, 1268. Schön, D. (1983). The Reflective Practitioner - How Professionals Think in Action. Basic Books. Council and Parliament agree to reduce food waste and set new rules on waste textile - Consilium Digital Passport https://www.europarl.europa.eu/RegData/etudes/STUD/2024/757808/EPRS_STU(2024)757808_EN.pdf
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Title of the MICRO CREDENTIAL	Combining Craft with Digital Technologies for Sustainability in Garment Design and Consumer Approaches – part 3: Body Driven Design
Development	Center for Applied Research in Textiles, Design & Circularity VIA University College
State of the Art	Clothing interacts directly with diverse bodies, movements, sensory sensitivities, and aesthetic identities, making standardized solutions less viable. As Cho, Karpova, and Chung (2025) argue, apparel design must address multiple and often conflicting variables—such as reach, dexterity, and mobility—requiring adaptable and nuanced design frameworks rather than singular universal solutions. This suggests a shift from standardized paradigm toward a flexible, process-oriented framework tailored to the lived, embodied nature of clothing. Designers need systematic methods to be able to study user experiences and emotions, these methods have to enable the empathic understanding of the user and how they use designs (Koskinen et al., 2003). This way we encourage the designers to design clothing that can be meaningful and functional, and meet users’ real needs. At a policy level, the European Commission’s Union of Equality: Strategy for the Rights of Persons with Disabilities 2021–2030 includes that every person with disabilities, regardless of their sex, racial or ethnic origin, religion or belief, age or sexual orientation can have equal opportunities, equal access to participate in society and economy and no longer experience discrimination (European Commission, 2021). Within this framework, access to basic needs must be understood as foundational to social inclusion. Clothing—particularly clothing that is comfortable, adjustable, and dignified—plays a critical role in enabling daily activities both inside and outside the home. The absence of such clothing options can contribute to feelings of exclusion, dependency, and social marginalization (Bhandari, 2024). From this perspective, inclusive fashion design should not merely be seen as an aesthetic or market concern but a matter of equality and human rights. Empathic research helps designers understand “life-expert users” — people whose everyday experiences, such as living with a disability, differ from the designer’s own. Empathy lets designers go beyond basic function and learn about users’ motivations, hopes, worries, and what really matters to them (McDonagh & Thomas, 2010). These deeper insights help designers create products that feel meaningful, not just usable. In this way, empathic design becomes a shared process where the user’s perspective shapes the final solution and leads to more thoughtful, human-centered outcomes (McDonagh & Thomas, 2010). In fashion, empathic design means looking beyond aesthetics and trends. It focuses on how clothing feels to the user, how it supports their body and movement, how it relates to identity and confidence, and how it fits into real-life situations. To achieve this, empathic methods are used early

	in the design process, when ideas are still open and flexible. This is often called the “fuzzy front end”, where exploring people’s needs can shape the entire direction of a concept (Koskinen et al., 2003). By applying empathy at the beginning, designers can uncover hidden needs, challenge assumptions, and create fashion that is not only functional but inclusive and emotionally resonant. This micro-credential addresses the need of empathic design methods by equipping design and business students with the skills and knowledge required to navigate both the opportunities and challenges of user-centered design and digital tools. Through a combination of project-based learning, co-creation approaches, and hands-on use of technologies such as body scanning and digital prototyping, students engage directly with end-users. This approach fosters collaborative innovation and prepares learners to actively contribute to more sustainable and inclusive developments in the fashion industry.
Objective/Aim of the course	This micro-credential equips design BA students with the knowledge and skills to explore the potential and challenges of digital tools in future business- and design scenarios. Using empathic design methods, learners will work with identifying and collecting data about the actual target group and developing products based on that. By using digital technologies like body scanning and 3D software, learners will explore how to develop better end-products concerning fit and aesthetic proportions, with a reduced number of physical prototypes.
Prerequisites for users to start the course	To start this course, learners/participants need to have basic knowledge and skills in the following areas: • Pattern making • Manufacturing • CLO3D • Design process
Required Equipment and software	• CLO3D • Printer/plotter • Body scanner / Scan with mobile application • Sewing machine

Workload	Lectures (user driven design, Pattern making)	Seminars	Project (development and manufacturing of product)	Laboratory Practice (body scan + CLO3D, sewing department)	Course assessments	Total
Teaching hours	8		4	6	4	
Individual study hours	4		8	6		
					Total hours	40
					Total ECTS	1,5

Learning outcomes- Knowledge and Skills	Knowledge: • knowledge about empathic design methods
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	- knowledge about possibilities of integrating biometric data (body data obtained from body scanning) and 3D technology in apparel product development Skills: - Apply body scanning software in the development of apparel products. - Apply 3D software in development of apparel products - Create/adjust 2D patterns according to biometric data - Asses fit and aesthetics based on biometric data
Syllabus	This course focuses on the integration of digital technologies to enhance design processes. Participants work by combining craftsmanship with digital technologies in order to develop more user-targeted products. The course begins with an introduction to empathic design methods, followed by data collection to identify the actual target group. The next step is body scanning, pattern making, and prototyping (physical/digital), finalized with assessment and evaluation. Empathic design - Empathic Design Methods - Participants work with identifying the actual target group's needs and biometric data Body scan - Introduction to body scanning - Participants work with body scanning representatives from the target group 2D pattern and 3D visualization - Analyzing body data and creating digital avatar - Introduction to CLO3D workflow - Work with development of patterns - Work with visualization and digital prototyping in CLO3D Physical Prototyping - Introduction to sewing lab - Sewing physical samples Evaluation - Assessment of function and aesthetics of products vs. target group
Learning/teaching delivery formats	The learning and teaching delivery formats selected for this course are: ✓ Workshops ✓ Lectures ✓ Case studies ✓ Guidance ✓ Project Based Learning ✓ Group work ✓ Lab work
Type of assessment	Group presentations and demonstrations: students prepare and deliver presentations showcasing their developed concept and understanding of the practical exercises and the ability to communicate innovative ideas.
Pathway for a Successful Learner	EU legislation will require fashion and textile companies to develop new digital infrastructures, primarily to comply with the Ecodesign Directive by establishing a platform for the digital product

	passport. However, beyond regulatory compliance, the creation of such digital platforms and infrastructures also facilitates the emergence of new communication communities. This course offers students the opportunity to explore and develop content for digital platforms that enable companies to foster communities and promote specific crafts and cultural heritage. By doing so, businesses can integrate broader perspectives into their sustainable transition, enhancing both engagement and long-term value creation.
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Title of the MICRO CREDENTIAL	The Red Thread of Sustainability – Crafts, Culture, and Creativity Driving Regenerative Actions for Fashion and Textile
Developer partner	AU; Aarhus University
State of the Art	The Red Thread of Sustainability is a 10 ECTS summer / winter school offered as part of the Horizon Europe-project, CRAFT-IT4SD (2024-26) in an ecosystem environment and in a partnership with local organisations, SMEs, and municipal actors working towards regeneration and circularity in Fashion and Textiles. The summer school explores how textile heritage, craft traditions, and design practices can support contemporary ecological, social, and cultural advancement. The course is grounded in current research on sustainable and regenerative design, circular economies, cultural heritage, and participatory design practices, addressing the urgent need for new approaches to production, consumption, and placemaking in the face of climate change and biodiversity loss. Positioned at the intersection of design, craft, and arts, culture and industry, the summer school investigates how historical traditional practices and place-based knowledge systems can inform future-oriented solutions. Central themes include design for planet and nature, the cultural and social dimensions of reuse, repair, and recycling, and the creative interconnections between digital and green transitions. The course is anchored in situated textile regions, understood as place-based textile ecosystems that hold deep reservoirs of cultural, textile and craft heritage as well as opportunities to innovate and renew practices through industry, design, and collaboration. Through these lenses, the course emphasises how sustainable placemaking and cultural strategies can engage citizens as active participants in transforming

	local narratives and reframing historical industrial locations and landscapes as contemporary regions of innovation shaped by craft, culture, and regeneration. The course integrates lectures, workshops, fieldwork, and co-creation methodologies, developed and communicated in close collaboration with local stakeholders. It progresses from historical and material foundations, through ecological values and knowledge systems, toward everyday practices and participatory action, culminating in the development and presentation of co-created designs, interventions or recommendations. The concrete output will push for change through acts like strategic rebranding, promotion of regenerative practices, local anchored material narratives, highlighting innovative relations between craft and technology. While the course is anchored in a specific local context, its structure and methodologies are designed to be adaptable to other regions with textile or craft-based heritage. The specific local context for The Red Thread Summer School is the old Danish Textile Region Herning–Ikast–Brande region which serves as the primary learning environment, contributing case studies As one of Denmark’s former textile powerhouses, the region offers a rich context in which connections between industry, art, craft, and culture shaped modern identity during the second half of the 20th century. The hub acts as a lighthouse for industrial and artistic environments, spilling over into regional and local placemaking, as can still be found in Herning with Birk Center Park’s campus and innovation environment including art, the HEART Art Museum and surrounding sculpture parks, the sustainably redesigned Højhuset, and the Herning Textile Museum (with a particular focus on the female workforce of the textile industry). These sites provide tangible entry points for explorations and discussions of labour and gender histories, material cultures, and the ongoing reinterpretation of industrial heritage. The summer school takes place in July 2026 and is offered in partnership with Herning Municipality, Bæredygtig Herning (Sustainable Herning), and as part of the Horizon Europe project CRAFT-IT4SD (2024-26). Through collaboration with local authorities, cultural institutions, companies, and civil society actors, students work on real-world challenges that reflect the region’s ambitions for green and digital transition. The local context of the textile hub in Herning and its stakeholders thus function as a living lab, demonstrating how local textile heritage and cultural practices can be activated in an ecosystem context as a resource for sustainable and regenerative futures.
Objective/Aim of the course	Students will be introduced to theories of sustainable design, fashion and textile, to theories of how craft techniques interconnect with new technology, to local placemaking and the integration of industrial heritage in urban regeneration and local identity. Students will be introduced to field work, gain skills in design thinking, critical making, and critical design narratives as well as competences in analysing and conceptualizing cross-sector sustainable innovation. The summer school will additionally introduce to participatory user and audience engagement and to European and global textile and fashion strategies and actions through critical thinking, making, and design fabulation as well as analysing and conceptualizing cross-sector sustainable innovation.
Prerequisites for users to start the course	The summer school is offered with an interdisciplinary approach. Experience in design thinking, co-creation and teamwork is required.

	We invite design and digital design students, students from environmental humanities, cultural and crafts studies, anthropology, landscape and heritage studies, and others from the SSH.
	The course is structured around the knowledge triangle, integrating education, research and innovation as mutually reinforcing learning modes. Through a combination of theoretical inquiry, case-based analysis, and practice-based co-creation with external stakeholders, students develop a holistic understanding of sustainability challenges as they unfold in real-world contexts. In the evaluation of the student's performance, emphasis is placed on the extent to which the student is able to: <u>Knowledge:</u> • Relate theoretical and analytical approaches to sustainable and regenerative design, sustainability in fashion and textile to local challenges, participatory design, and user / citizen interaction. • Apply the key theoretical and methodological approaches of the course • Critically reflect on their own oral and/or written products (and those produced by others) in relation to the academic and theoretical discussions of the course <u>Skills:</u> • Co-create, conceptualize, test, prototype and present a solution, an intervention, or a recommendation to a challenge through a design thinking process • Discuss the theme of the course in the foreign language in an academic context <u>Competences:</u> • Reflect on one's own role as a researcher and innovator in the field and in experimental environments • Participate constructively in learning collaboration in a foreign language across educational and/or cultural backgrounds • Gain perspective on and compare the academic profile of the degree program in relation to the subject areas of the humanities
Syllabus	The Red Thread Summer School consists of two parts: A series of <u>online sessions</u> which lays the theoretical framework through introduction to and discussion of recommended readings as well as the general scope of the course. Students will be introduced to themes as rediscovering local crafts, cultural heritage and new circular business models, to gain a deeper understanding of contemporary sustainable practices through theories and methods of textile philosophies, design thinking and critical making. During the online sessions readings will unfold over from module 1-3 (see below) in different online formats: presentations and lectures and groupwork ideation and discussion sessions, encouraging the students to participate in small workshop activities from their online location spots. During these online sessions, the summer school challenges will be presented, stakeholders introduced, and participants will get to know one another. The modules 1-3, building on the reading list of key texts and presented mainly during the online part of the summer school, are directly transferable to summer schools conducted in other textile ecosystems. The online part counts for 3 ECTS.

A two weeks' onsite co-creation environment, in Herning, during which participants will work in facilitated and supervised project groups towards challenges put forward by the local sustainability incubator, Bæredygtig Herning, and Herning Municipality, performing field work and documentation, and going through a design thinking process to produce a solution, an intervention or a recommendation. The program structure is based on the Double Diamond model (Design Council, 2005) guiding the students through the different phases of the design process. The on-site program activities will be facilitated by AU and Bæredygtig Herning. To support the in-house design and production related activities, the co-creation partnership organizes field visits, expert talks, stakeholder meetings, and site-specific workshops. These activities are integrated into the design process as sources of insight, inspiration, and critical reflection, and are strategically integrated within different phases of the Double Diamond (e.g., exploration through fieldwork, definition through partner dialogue, development through prototyping workshops, and delivery through public presentations and exhibitions). During the final days, students will present their findings and output through a pitch talk to relevant ecosystem stakeholders, followed by a public exhibition format, inviting local audiences, communities, organisations, and businesses.

The two weeks onsite part of the summer school offers a situated learning environment, based in the local or regional textile ecosystem and the cases put forward by ecosystem actors and stakeholders. The onsite part of the summer school counts for 7 ECTS. The problem or case-based learning format is fully transferable (see module 4), much of the content references module 1-3, while the actual casework depends on the local ecosystem and partnership, its capacity and requirements.

The final assignment is a multimodal portfolio-exam handed in a week after the finalisation of the summer school, consisting of group assignments in documentation, conceptualisation, prototyping, pitch and final production (all produced during the summer school) and an individual reflection assignment.

Module 1 Industrial & Cultural Heritage: A tale of local textile traditions – past to present

This module concisely introduces students to the historical transformation of textile production from handcraft to industrial manufacturing and the place-based textile region embedded in a broader industrial and cultural history. Through a layered approach that moves from global technological shifts to local industry, gendered labour, and contemporary innovation, the module establishes a shared historical foundation for understanding textile heritage as both an economic system and a lived cultural practice. The module prepares students to critically engage with sustainability, design, and co-creation in relation to the textile industry.

Learning objectives

- Develop an understanding of how the evolution of textile machinery and technologies have shaped cultural practices, labour structures, and industrial development across textile regions.
- Develop a critical understanding of the cultural and industrial heritage of a situated textile region, and how such regional histories continue to influence and inform contemporary textile practices.
- Demonstrate the ability to analyse how historical trajectories continue to shape the contemporary cultural landscape and economic dynamics of the textile hubs.

Topics covered

From Hand to Machine: Technology, Labor, and Textile Heritage

- From craft to mechanisation: Examines the historical transition from hand-based textile production to mechanised manufacturing, highlighting how technological innovations reshaped labour organisation, productivity, and cultural values. Drawing on examples from early spinning technologies to industrial weaving, the lecture positions machinery as both a technical driver and a cultural force in the formation of modern textile industries.
- Textile machinery as proto-digital culture: Traces key technological milestones; from the Spinning Jenny and the Jacquard Loom to punch-card systems and early computational thinking, showing how textile technologies laid foundations for later digital systems. The lecture introduces figures such as Charles Babbage and Ada Lovelace to frame textiles as an overlooked origin of digital and gendered technological histories.

Key Literature

- Wilson, K. (2021) A History of textiles. Routledge (Chapter 8)
- Munroe, N. (2024) Skilled Immigrants in the Textile and Fashion Industries: Stories from a Globe-Spanning History. Bloomsbury Visual Arts. (Chapter 5 Appendix)

Supplementary

- Plant, S (1998) Zeros and Ones: Digital Women and the New Techno culture. Fourth Estate. Chapter 1–2

Situated textile history, innovation & craft traditions

- From rural craft to industrial hub: Introduces the cultural and industrial foundations of a locally situated textile region, tracing its development from small-scale, domestic craft practices to a player on international scale, leading dynamic textile productions and design clusters. The lecture highlights how local knowledge, adaptability, and entrepreneurial spirit supported early industrialisation.
- Local materials and value creation: Focuses on the role of local materials, e.g. Nordic wool as an economic, ecological, and cultural resource. Drawing on Klepp and Tobiasson's (2022) work on local and slow fashion, the topic explores how material traditions, craft expertise, and design sensibilities shaped regional aesthetics, innovation cultures, and long-term resilience and how these traditions can be reinterpreted into present and future contexts.

Key Literature

- Klepp, I. G., & Tobiasson, T. S. (2022). *Local, Slow and Sustainable Fashion: Wool as a Fabric for Change*. Palgrave Macmillan. Chapter 1 + 3

Supplementary

- Schaeffer, P. V., & Loveridge, S. (2000). *Small Town and Rural Economic Development: A case studies approach*. (Chapter 30)
- Håndværk Bookazine no. 13 (Danish)
- Hedestrik, 2025 (Danish)

Invisible Threads: Cultural Histories and Home-Based Micro stories of the Female Textile Workforce

- Homes and domestic economies as sites of production: Investigates how home-based textile work, care labour, and craft skills, largely performed by women, supported later factory production and community cohesion. The lecture foregrounds everyday routines and informal knowledge as integral, yet often invisible, components of industrial success.
- Microhistories and cultural identity: Using oral histories, archival materials, and domestic objects, this topic examines how personal narratives and lived experiences reveal broader cultural and industrial transformations in the local textile hotspots showcasing the interplay between private everyday life, local production, factory work, and regional capacity building and cultural identity. Drawing on Parker (2019) the lecture provides a critical cultural perspective that complements technological and economic histories.

Key Literature

- Parker, R. (1986/2019). The subversive stitch: Embroidery and the making of the feminine (2nd ed.). I. B. Tauris. Introduction + Chapter 1 + 4

Supplementary

- Smith, A. (2020) Thread ripper, Gyldendal hybrid (Danish)
- Munroe, N. (2024) Skilled Immigrants in the Textile and Fashion Industries: Stories from a Globe-Spanning History. Bloomsbury Visual Arts. (Chapter 1–3)

Present context: From old textile hub to sustainable innovation landscape

- Heritage and crafts as drivers for contemporary practice: Examines how local textile tradition and heritage continues to shape present-day identity, entrepreneurial culture, and collaborative practices across design, sustainability, micro companies, and cultural production. The lecture frames craft heritage not as static history, but as an active resource for innovation. The lecture gives a present-day overview of the situated textile region.
- From history to cases: Introduces key locally situated initiatives and actors, cultural institutions, local companies, and municipal stakeholders to demonstrate how textile heritage informs contemporary strategies related to circular economy, green transition, and climate and biodiversity goals. This topic sets the contextual foundation for the case-based and co-creative work in later modules.

Key Literature

- <https://www.baeredygtigherning.dk/en>
- <https://museummidtjylland.dk/tekstilmuseet/> (Danish only)

Module 2: Design for planet and nature

This module introduces students to ecological and social sustainability as value-driven design challenges within the creative and cultural sectors. Beginning with Earth-first principles, the module establishes ethical and ecological foundations for design decision-making. It then moves to people and knowledge, examining climate migration, cultural resilience, and the role of craft and situated knowledge in shaping adaptive and inclusive design practices. Finally, the module focuses on communication and action, exploring how design narratives and creative interventions can translate complex sustainability challenges into shared understanding and

collective engagement. Together, the module equips students with conceptual frameworks and practical tools to critically engage with sustainability through design, culture, and craft.

Learning objectives

- Identify and analyse key drivers for ecological and social sustainable transition within the creative and cultural sectors, hereof connecting theoretical perspectives from sustainability studies and relational and care-based ecological thinking to practical examples and case studies.
- Demonstrate the ability to critically discuss and reflect on the relevance of craft practices in contemporary ecological, social, and cultural contexts, including their relationship to technology, value systems, and modes of production.

Topics covered

Transforming practices, new approaches to design

- Unravelling the fashion industry: Examines the environmental and social impacts of the fashion and textile industries, addressing the complexities, contradictions, and power structures embedded in global value chains. Drawing on Fletcher (2014) research on sustainable fashion pathways, the lecture introduces alternative approaches to production, consumption, and value creation. Inspired by Engholm's design philosophy (2023), students are invited to critically debate designers' responsibilities and possible courses of action in a changing world.
- Emerging business models: Building on recent research from VTT and CRAFT-IT4SD, this lecture explores circular, regenerative, and service-based business models as responses to ecological limits and shifting consumer expectations. By critically engaging with text material, students analyse dominant trends and consumption behaviours, identifying tensions between growth-oriented models and emerging sustainable alternatives.
- The R-strategies: Introduces the R-strategies as a framework for understanding different levels of intervention within design and production systems, students are introduced to circular design principles that encourage reduced resource use, extended product life cycles, and new ways of conceptualising material flows and long-term value.

Key literature:

- Fletcher, K. (2014). Sustainable Fashion and Textiles (2nd ed.). Routledge (Chapter 1 + 2 + 6; Chapter 3 + 5 optional)
- Markkula, A. et al. (2024) Sustainable Circular Business
- Engholm, I. (2023) Designing for the New World. (Introduction)

Supplementary:

- McKinsey & Company. The State of Fashion 2019/2026 (Brief overview)
- Fletcher, K. & Tham, M. (eds.) (2015). The Routledge Handbook of Sustainability and Fashion. Routledge. (Chapter 1 + 5 + 6 + 16)
- Petänen, P., Tuovila, H., & Markkula, A. (2025, May 23). The market environment of sustainable fashion business models. CRAFT-IT4SD. <https://craft-it4sd.eu/the-market-environment-of-sustainable-fashion-business-models/>
- Bocken NMP, Niessen L and Short SW (2022) The Sufficiency-Based Circular Economy—An Analysis of 150 Companies.

Climate mitigation and biodiversity awareness through design and culture

- Earth first principles and human ecology: Introduces Earth First principles as a conceptual framework that reorders relationships between humans, nature, and the planet. Drawing on Papanek (1997) the lecture situates design within broader ecological systems and emphasises responsibility beyond human-centred perspectives.
- Climate Migration, Cultural Resilience, and Knowledge-Based Design: Examines climate-induced displacement as both a social challenge and a cultural resource, focusing on how migrating and indigenous communities carry craft traditions, material knowledge, and adaptive practices into new contexts. The lecture explores how design can recognise, integrate, and ethically engage with this knowledge to foster resilient, pluralistic, and culturally grounded textile ecosystems. Drawing on Escobar (2018), the topic highlights design's role in supporting social inclusion, ecological adaptation, and shared futures.
- Creative narratives for environmental action: Analyses how storytelling and cultural interventions can shape public understanding of climate and biodiversity crises. The lecture introduces and gives examples of principles of nudging, narrative framing, and participatory communication as tools for fostering collective ecological awareness and action.

Key Literature:

- Fletcher, K. (2021). *Earth logic: Fashion action research plan*. The J. J. Charitable Trust.
- Escobar, A. (2018). *Designs for the pluriverse: Radical interdependence, autonomy, and the making of worlds*. Duke University Press. (Introduction + Part I, Chapter 1 + 2; Chapter 5 Optional)

Supplementary:

- Papanek, V. *Design for the Real World* (1997) (Chapter 1–3)
- Tunstall, E. (2013). Decolonizing design innovation. In W. Gunn, T. Otto, & R. C. Smith (Eds.), *Design anthropology* (pp. 232–250). Bloomsbury.
- Markkula, A. et al. (2025) Analysing the climate impact of SME fashion business models. CRAFT-IT4SD. <https://craft-it4sd.eu/analysing-the-climate-impacts-of-sme-fashion-business-models/>

Rediscovering craft in a contemporary context

- Craft, Sustainability, and Knowledge-Based Innovation: Craft, Sustainability, and Knowledge-Based Innovation: Investigates how traditional craft methods, material knowledge, and handwork can inform contemporary sustainable design approaches, and how digital tools can extend these practices into new design contexts. The lecture positions craftspeople as stewards of cultural, material, and environmental knowledge, whose skills are embedded in local ecosystems and social practices. Through contemporary examples, students explore how design can draw on this knowledge to support environmentally grounded innovation-while critically reflecting on how craft knowledge is transferred, adapted, and respected in modern design contexts.
- Digitalized craft and hybrid futures: This lecture examines how craft is translated, reinterpreted, and expanded through digital technologies such as CAD, digital weaving, computational design, and digital fabrication. Rather than positioning craft and technology as opposites, the topic explores hybrid practices where digital tools support new forms of making, storytelling, and dissemination while retaining craft's

emphasis on material sensitivity, slowness, and care. Students are invited to critically reflect on what craft might mean in the future: how technology can strengthen the cultural, ethical, and communicative value of crafted objects, and where tensions arise around authorship, authenticity, sustainability, and scale.

Examples:

- Smith A. (2022) Looming (artistic project) <https://www.amaliesmith.dk/looming>
- Bon F. & Michaluszko A. (2021) Argumented Weaving <https://linktr.ee/augmentedweaving>
- Polish Fashion Stories. (2024, April). *Craft and tech: Collaborators, not rivals*. <https://www.polishfashionstories.com/we-love-1/2024/4/craft-and-tech-collaborators-not-rivals>
- STEM <https://www.stem.page>
- Rodinia Generations <https://www.rodiniageneration.io>

Supplementary:

- Nimkulrat, N., Kane, F., & Walton, K. (2016). *Crafting textiles in the digital age*. Bloomsbury Academic (Chapter 5 + 7 + 11)

Module 3: Revitalization of cultural heritage and textile tradition through design

This module explores how textile heritage can be revitalized through design practices using bottom-up strategy that centres use, care, repair, and participation rather than production. Building on the value-oriented perspectives of module 2, the module shifts attention to everyday relationships with textiles—how garments are worn, maintained, repaired, shared, and understood over time. Through critical and speculative design approaches, students are introduced to design as a reflective and cultural practice that can question dominant consumption patterns and reveal hidden narratives embedded in textile traditions. The module further examines circular design from the consumer’s perspective, emphasizing repair and care as meaningful, culturally embedded practices that foster emotional attachment, responsibility, and long-term use. Finally, the module introduces participatory and co-creative methodologies that actively involve citizens, local practitioners, and institutions in preserving and reinterpreting textile heritage, while introducing digital tools to form new solutions. Together, the topics position design as a mediator between heritage and everyday life, enabling socially inclusive, culturally grounded, and environmentally responsible textile futures.

Learning objectives

- Critically analyse how design can engage with and revitalize textile heritage, addressing cultural, ecological, and social dimensions.
- Evaluate how repair, care, and rights to reuse can extend the life of textiles and reshape consumer relationships with clothing.
- Apply co-creative and participatory design approaches that involve communities and citizens in preserving heritage, co-creating knowledge, and shaping socially and culturally inclusive design practices.

Topics covered

Critical design and Philosophies of Textile

- Critical and speculative design through textile philosophy: This topic introduces critical and speculative design as reflective practices that question dominant assumptions about fashion, textiles, and consumption. Drawing on Rosner (2018) and Haraway (2016), design is positioned as a way of thinking-with materials rather than solving problems. Integrating Dormor's (2020) philosophy of textile, the lecture foregrounds textiles as relational, temporal, and embodied media – materials that carry meaning through making, wearing, care, and decay. Speculative design is thus framed as a method for asking difficult questions about responsibility, continuity, and entanglement within textile traditions.
- Textile philosophy and user behaviour: Building on Dormor's (2020) argument that textiles mediate how we sense, inhabit, and value the world, this theme explores how design interventions can shape user understanding and behaviour through material experience. Examples from Dunne & Raby (2013), Lucy McRae, and textile-based speculative practices demonstrate how altered material qualities, narratives, or contexts can prompt reflection on clothing use, care, repair, and disposal. Rather than persuasion or nudging alone, the focus is on how textile philosophies like; touch, intimacy, vulnerability, and maintenance, can reframe everyday relationships with garments.
- Connecting heritage and innovation: This theme explores how critical and speculative design can activate textile heritage by reinterpreting traditional techniques, labour histories, and material knowledge in contemporary contexts. Drawing on Dormor's (2020) positioning of textiles as practices rather than static objects, heritage is understood as living, contested, and continually remade through use and reinterpretation. Speculative approaches are used to connect past and future textile imaginaries, linking craft knowledge, industrial histories, and emerging technologies, while foregrounding ethical questions of care, authorship, and cultural value.

Key Literature:

- Rosner, D. K. (2018). Critical Fabulations: Reworking the Methods and Margins of Design. MIT Press. (Introduction + Chapter 1)
- Haraway, D. (2016). Staying with the Trouble. Duke University Press. (Chapter 1–3)
- Dormor, C. (2020) A Philosophy of Textile: Between Practice and Theory. Bloomsbury Visual Arts. (Chapter 1–3)

Supplementary:

- Dunne, A. & Raby, F. (2013) Speculative everything: Design, Fiction and Social Dreaming. MIT Press (Chapter 5)
- Kjeldsen, J., & Løfgren, B. (2025, May 23). Triple transition in the creative economy: How up- and re-skilling is shaping emerging professions. CRAFT-IT4SD. <https://craft-it4sd.eu/triple-transition-in-the-creative-economy-how-up-and-re-skilling-is-shaping-emerging-professions/>
- Tadayoni Heiberg S. (2021) Plantae sapien: utopisk bio-fi. Uro

Examples:

- <https://www.lucymcrae.net>
- Jens Ole Arnasen (<https://www.jensolearnason.com>)

Circular design, repair cultures, rights to reuse

- Consumer relationships with textiles: Explores how emotional attachment, personal histories, and everyday routines shape consumer engagement with clothing. Drawing on Fletcher's (2016) concept of craft of use and Thanhauser's (2022) historical accounts of wear and repair, the topic highlights how garments accumulate meaning through use. This perspective reframes sustainability as a matter of ongoing relationships rather than one-time purchasing decisions.
- Repair as cultural practice: Positions repair, mending, and maintenance as culturally embedded practices that combine skill, care, and identity. Repair is discussed not only as an ecological strategy, but as a form of everyday craft that can be:
 - Hobby-based (e.g. home mending, community repair cafés),
 - Professionally mediated (tailors, repair services),
 - Strategically integrated into business models.

The topic explicitly foregrounds care as a design value—care for materials, labour, and users—connecting repair to agency, responsibility, and respect.

- Reuse, Recycling Systems, and Consumer Responsibility: Builds on consumer–textile relationships by expanding the focus from individual reuse practices to broader material cycles. The topic examines how repair and reuse interact with recycling systems, highlighting the limits, losses, and trade-offs embedded in textile recycling. Through field visits, students gain first-hand insight into reuse and recycling processes, material degradation, and infrastructural challenges, making visible why reuse, care, and extended use are often more sustainable than recycling alone.

Key Literature:

- Fletcher, K. (2016). *Craft of Use*. Routledge. (Chapter 1 + 2 + 6)
- Terzioğlu, N. (2021). "Repair motivation and barriers model." *Journal of Cleaner Production*.

Supplementary:

- Thanhauser, S. (2022). *Worn: A People's History of Clothing*. Pantheon Books. (Introduction + Chapter 2 + 13)

Citizen engagement & participatory culture

- Community-driven design: Investigates participatory design methods that actively involve citizens and municipal governance as co-designers rather than passive users, drawing on Manzini's (2015) concept of design for social innovation. Tools such as workshops, probing, storytelling, material-based inquiry, and collaborative prototyping are introduced. The topic explores how citizen-led and community-based design initiatives can raise awareness, challenge established consumer behaviours, and support more sustainable textile practices. Emphasis is placed on the social impacts of participation, including strengthened community ties, intergenerational knowledge exchange, and the revitalisation of textile heritage as a shared cultural resource that creates value for local communities.
- Co-creation as a methodology for social and cultural impact: Focuses on co-creation as a structured design methodology that enables active collaboration between designers, citizens, craftspeople, and institutions. Drawing on Lee's (2008) work on participation tactics, the topic explores:
 - How collaborators are included throughout the design process,
 - How roles and power relations are negotiated,
 - How co-creative projects can generate cultural value beyond physical outcomes.

Case examples demonstrate how co-creation can strengthen heritage preservation, support sustainable practices, and foster community cohesion.

Key Literature:

- Lee, Y. (2008). Design participation tactics: The challenges and new roles for designers in the co-design process. CoDesign.
- Manzini, E. (2015). Design, When Everybody Designs: An Introduction to Design for Social Innovation. MIT Press. (Chapter 1–3)

Supplementary:

- Krogh, Koskinen (2020) Drifting by intention. Design Research Foundations. (Chapter 5)

Module 4: Co-creating Lab: conceptualizing, development and production of creative recommendations with local partners

In the final module the students will apply their knowledge and experiences to collaboratively create solutions, interventions, or strategic recommendations that raise awareness into a case specific context. The cases are developed in close collaboration with local partners and respond to their opportunities and constraints related to green and digital transitions within the textile and fashion ecosystem. Working in facilitated project groups, students follow a structured design process grounded in the Double Diamond framework, moving from exploration and problem framing to ideation, prototyping, and refinement. The module integrates insights from cultural heritage studies, sustainable business models, design theory, and participatory methodologies. Through fieldwork, co-creation activities, prototyping, and iterative feedback, students develop and test concepts that are both context-sensitive and actionable. The module concludes with final presentations to peers and external stakeholders, who provide expert feedback on relevance, feasibility, and potential impact.

Learning Objectives:

- Integrate knowledge and methods from the course into a real-world business context.
- Develop and communicate viable design concepts, interventions, or strategic recommendations for relevant stakeholders.
- Critically reflect on feedback to assess viability and strategic impact of the proposed concept and its anticipated impact.
- Collaborate effectively in interdisciplinary and multicultural teams using English as a working language.
- Apply practical skills in facilitation, teamwork, prototyping, and iterative design processes.

Topics Covered:

Concept development, co-creation and prototyping

- Design process and collaborative methods: Introduces the Double Diamond framework and 5C model as the overarching structure for the on-site co-creation process, guiding students through phases of exploration (discover), problem framing (define), ideation (develop), and refinement (deliver). The model provides a structured methods for group ideation, insight synthesis, and translating fieldwork, partner input, and theoretical perspectives into clear design directions.
- Co-creation practices with partners: Applies participatory and co-creative tools for working with local partners, stakeholders, and communities. Emphasis is placed on

	integrating external perspectives into the concept and design process through dialogue, workshops, testing, and iterative feedback, ensuring that solutions remain grounded in real needs and contexts. • Prototyping tools and workflows: Explores analogue and digital prototyping methods—including sketching, mock-ups, low-fidelity models, storyboards, and communication prototypes—as tools for thinking, testing, and collaboration. Prototypes are used as a ‘Proof of Concept’ to explore feasibility, communicate ideas, and support decision-making rather than as finished products. <i>Final Presentation and Expert Feedback</i> • Pitching and communicating concepts: Prepares students to present in pitch format their solution, creative recommendation, or intervention clearly to partners, peers, and experts, focusing on storytelling, visualisation and strategic framing. • Feedback and refinement: Engages students in feedback sessions with partners and instructors, supporting critical reflection on the concept’s relevance, strategic alignment, and potential impact. Feedback is used as a learning tool to refine both the project outcomes and students’ understanding of a collaborative design practice. <i>Toolbox:</i> • https://sustainabledesigncards.dk • https://ai.boardofinnovation.com/future-scenarios • https://materialpathways.dk <i>Literature:</i> • Friis, S. A. K. & Gelting, A. K., (2014) The 5C Model • Design Council. (2005). The Double Diamond: A universally accepted depiction of the design process. Design Council. https://www.designcouncil.org.uk/news-opinion/double-diamond-universally-accepted-depiction-design-process
Learning/teaching delivery formats	• Workshops • Seminars • Talks • Case studies • Citizen and Stakeholder Engagement • Project and Problem Based Learning (PBL) • Stakeholder pitches • Public Presentations and Exhibition
Type of assessment	As a part of the course, the student produces portfolio solutions for a number of assignments. The number of assignments, their form (individual and/or group-based, written, oral, product, reflection, peer feedback, set question or student’s choice of question, etc.), their length and the deadlines for submission are announced in writing by the course offered and orally by the teacher at the beginning of the course. The assignments can provide the basis for different forms of feedback and further development related to the teaching. All or a selection of these assignments can provide the basis for the student’s exam.
Pathway for a Successful Learner	The summer school offers access to a strong, multi-helix ecosystem around sustainable fashion and textiles and to the crafts history of an old textile region (since the 17th century). Through a challenge-based, real-world approach, the summer school participants will experience working with local stakeholders and industry, while operating in a cross-disciplinary learning environment.

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- Tunstall, E. (2013). Decolonizing design innovation. In W. Gunn, T. Otto, & R. C. Smith (Eds.), *Design anthropology* (pp. 232–250). Bloomsbury.
- Markkula, A. et al. (2025) Analysing the climate impact of SME fashion business models. CRAFT-IT4SD. <https://craft-it4sd.eu/analysing-the-climate-impacts-of-sme-fashion-business-models/>
- Bocken NMP, Niessen L and Short SW (2022) The Sufficiency-Based Circular Economy—An Analysis of 150 Companies.
- Nimkulrat, N., Kane, F., & Walton, K. (2016). *Crafting textiles in the digital age*. Bloomsbury Academic (Chapter 5 + 7 + 11)
- Dunne, A. & Raby, F. (2013) *Speculative everything: Design, Fiction and Social Dreaming*. MIT Press (Chapter 5)
- Kjeldsen, J., & Løfgren, B. (2025, May 23). Triple transition in the creative economy: How up- and re-skilling is shaping emerging professions. CRAFT-IT4SD. <https://craft-it4sd.eu/triple-transition-in-the-creative-economy-how-up-and-re-skilling-is-shaping-emerging-professions/>
- Tadayoni Heiberg S. (2021) *Plantae sapien: utopisk bio-fi*. Uro
- Thanhauser, S. (2022). *Worn: A People's History of Clothing*. Pantheon Books. (Introduction + Chapter 12)
- Krogh, Koskinen (2020) *Drifting by intention*. Design Research Foundations. (Chapter 5)

Examples

- Smith A. (2022) *Looming* (artistic project) <https://www.amaliesmith.dk/looming>
- Bon F. & Michaluszko A. (2021) *Argumented Weaving* <https://linktr.ee/augmentedweaving>
- Polish Fashion Stories. (2024, April). *Craft and tech: Collaborators, not rivals*. <https://www.polishfashionstories.com/we-love-1/2024/4/craft-and-tech-collaborators-not-rivals>
- STEM <https://www.stem.page>
- Rodinia Generations <https://www.rodiniageneration.io>
- <https://www.lucymcrae.net>
- Jens Ole Arnasen (<https://www.jensolearnason.com>)

Toolboxes

- <https://sustainabledesigncards.dk>
- <https://ai.boardofinnovation.com/future-scenarios>
- <https://materialpathways.dk>

Title of the MICRO CREDENTIAL	Fashion of the Future: Pioneering Digital and Sustainable Business Models with Legislative Integration
Developer partner	MODACC - Catalan Association of textile and fashion
State of the Art	The fashion industry is undergoing a profound transformation driven by the convergence of sustainability, digitalization, and evolving legislative obligations (McKinsey & Company, 2022). Recent scholarship refers to the combined impact of sustainability and digital transformation as <i>Digitainability</i> (Brown et al., 2022), reflecting a shift toward treating these forces as interconnected rather than separate. This integrated perspective is increasingly shaping how companies restructure business models, reconfigure supply chains, and redefine stakeholder roles across the sector. Research consistently shows that firms adopting both digital tools and sustainability practices achieve greater operational efficiency, reduced environmental footprint, and improved competitiveness (Brown et al., 2022; Zhang & Li, 2021). Digitalization enhances transparency and traceability—key requirements for sustainable value chains—through technologies such as blockchain, predictive AI systems, and automated sustainability reporting (González et al., 2023). These capabilities enable companies to capture data more accurately, monitor performance in real time, and support decision-making that aligns with environmental and social commitments. Legislative frameworks, particularly within the European Union, are accelerating this integration by establishing new standards for corporate accountability. Regulations such as the Corporate Sustainability Reporting Directive (CSRD) and the Ecodesign for Sustainable Products Regulation (ESPR) require businesses to embed sustainability metrics into their operations and reporting processes (European Commission, 2023). Compliance is no longer a peripheral activity: it drives companies to adopt digital systems that ensure reliability, traceability, and data transparency. This regulatory environment reinforces the need for professional profiles capable of understanding both sustainability principles and the digital infrastructures that support them. The combined adoption of digitalization and sustainability—central to Digitainability—is reshaping value creation models across the fashion sector. Sustainable supply chain innovation enables companies to transition from traditional linear approaches toward circular economies focused on waste reduction, responsible sourcing, and material recirculation (Smith, 2021). Digital technologies such as digital twins and smart manufacturing support this transition by enabling real-time monitoring, adaptive production, and more efficient resource use (Wu, 2022). Blockchain systems strengthen traceability and build consumer trust by providing immutable records of product origin and sustainability attributes (Patel, 2020). In parallel, data-driven decision-making empowers firms to track sustainability indicators, optimize processes, and respond more effectively to disruptions and market changes (Jones, 2022). To guide this transformation, several strategic roadmaps highlight the steps companies should take to integrate sustainability and digitalization effectively. McKinsey & Company (2022) and

	Deloitte (2021) outline common elements, including internal assessment and benchmarking, regulatory alignment, the adoption of AI, blockchain, and digital twins, enhanced stakeholder collaboration across the value chain, and continuous monitoring using standardized sustainability reporting frameworks. These roadmaps reflect a growing consensus in the literature on the actions required to operationalize Digitainability within organizations. Companies that proactively implement digital and sustainable innovations gain a clear competitive advantage. As noted by Thompson (2021), early adopters not only mitigate risks associated with regulatory non-compliance but also position themselves as industry leaders capable of shaping sectoral standards. Their ability to demonstrate verifiable sustainability performance strengthens brand credibility, supports long-term profitability, and opens new opportunities for strategic partnerships. In an increasingly regulated and data-driven market, businesses that embrace Digitainability holistically improve resilience, strengthen innovation capacity, and secure a stronger position in a rapidly evolving global landscape.
Objective/Aim of the course	Main Objective To equip fashion industry professionals with the practical knowledge and applied skills needed to integrate sustainability, digitalization, and legislative requirements, enabling them to contribute effectively to the industry's transition toward innovative and sustainable business models. Secondary Objectives • Enable participants to understand and apply the concept of Digitainability and its strategic relevance for textile and fashion SMEs. • Build the capacity to interpret emerging EU legislation and translate regulatory requirements into competitive business practices. • Develop competencies to identify, select, and implement digital tools that support sustainability and compliance (e.g., blockchain, AI, digital traceability). • Strengthen analytical skills for diagnosing business challenges and shaping solutions grounded in sustainability principles. • Apply Design Thinking methods within organisational processes to foster creative, holistic approaches to sustainability and digital transformation.
Prerequisites for users to start the course	To start this course, learners generally need to have knowledge and skills in the following areas: • Basic understanding of sustainability principles in the fashion industry, including knowledge of global frameworks (e.g., EU Green Deal, circular economy, and key sustainability challenges like waste and emissions). • Familiarity with digital transformation concepts such as cloud computing, data analytics, blockchain, and AI, with an awareness of how these technologies impact business models. • An understanding of business challenges, particularly those related to sustainability, and the ability to apply basic problem-solving skills to real-world scenarios. • Strong critical thinking and problem-solving skills, with the ability to navigate complex business scenarios and propose effective, data-informed sustainability strategies.

	Effective communication and collaboration skills to engage with internal and external stakeholders, such as teams, suppliers, and policymakers, to support the successful implementation of digital and sustainability transitions.					
Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	8	4	5	6	3	28
Individual study hours	3	1	5	2	3	12
					Total hours	40
					Total ECTS	1,6
Learning outcomes- Knowledge and Skills	Knowledge: - Comprehensive understanding of the challenges and opportunities presented by the green and digital transitions for SMEs in the textile and fashion industries, with a focus on the interconnected nature of these transitions. - Expertise in mapping and integrating relevant regulations (e.g., EU Green Deal, CSRD) and identifying key stakeholders to drive collaboration and compliance across the value chain. - Proficiency in digital tools and technologies that enable sustainability efforts, including how to monitor sustainability impacts and scale-up sustainable solutions through digital innovation. - In-depth knowledge of sustainability-driven business models, particularly those relevant to fashion, and understanding of how to implement these models to create strategic competitive advantages. - In-depth knowledge of circular economy principles and how they can be applied in fashion and textiles to reduce waste, extend product lifecycles, and optimize resource use. Skills: - Competence in design thinking methodologies, facilitating collaborative innovation and enabling cross-sector partnerships between stakeholders at both the ecosystem and corporate levels. - Ability to develop and implement sustainability strategies that are aligned with industry regulations, addressing social justice and environmental sustainability, while considering business feasibility. - Application of data-driven decision-making processes to support the promotion and scaling of digital sustainability practices, focusing on measurable impacts and continuous improvement. - Effective communication skills to clearly and transparently convey sustainability strategies, ensuring that the value and impact of these initiatives are understood by relevant target groups (e.g., consumers, business partners, policymakers). - Competence in systems thinking, enabling learners to evaluate the broader environmental, social, and economic implications of sustainability and digitalization decisions across the fashion supply chain. - Ability to identify sustainability impacts, including the application of metrics such as carbon footprinting, water usage, and waste reduction, and the integration of these metrics into business decision-making processes.					

Syllabus	Conceptualization This micro-credential equips professionals with the knowledge and tools needed to navigate the complexities of sustainability, digital transformation, and legislative requirements within the fashion industry. Designed for entrepreneurs, sustainability officers, and industry professionals, the course provides practical strategies for integrating sustainability principles, leveraging digital technologies, and ensuring regulatory integration in business operations and value creation. <i>Module 1: Introduction</i> This foundational module provides an overview of the three key topics of the micro-credential: sustainability, digital transformation, and legislative integration. Learners will establish a common knowledge base that will be referenced throughout the course. The module covers historical context, current trends, and the latest developments in each area. Learning Objectives: • Build a common understanding of key concepts in sustainability, digitalization, and legislation. • Explore the historical evolution and future trends shaping the fashion industry. Topics Covered: 1. <i>Overview of the Fashion Industry</i> • Historical relevance and transformation: An overview of how the fashion industry has evolved over the decades, focusing on key shifts in production, consumption, and environmental impact. • Current state and impacts: Understanding the current challenges faced by the fashion industry, such as waste, labor issues, and its environmental footprint. • Key trends shaping the future of fashion: Analysis of emerging trends such as sustainable fashion, digitalization, and circular economy models that are transforming the sector. 2. <i>Overview of Digital Technologies for Fashion</i> • Role and relevance of digitalization: Explores how digital tools, such as AI, blockchain, and 3D design, have reshaped fashion design, manufacturing, and distribution processes. • Key digital technologies and their applications: A deeper look at technologies like digital supply chains, RFID, and data analytics that help fashion brands become more efficient and transparent. 3. <i>Overview of Legislative Efforts in the EU</i> • The European Green Deal and its implications: Overview of the EU's Green Deal and how it directly impacts the fashion industry, particularly concerning sustainability, waste reduction, and green growth. • Key legislation and regulations influencing fashion and textiles: An examination of crucial regulations, such as the Circular Economy Action Plan and the Ecodesign for Sustainable Products Regulation (ESPR), that shape industry behavior. • Understanding the regulatory landscape: How EU regulations affect SMEs in the textile and fashion sectors, with a focus on compliance and opportunities for competitive advantage. <i>Module 2: Interconnected Systems: Digitainability and Regulatory Integration</i> This module explores the intersection of digitalization and sustainability, forming the concept of Digitainability, as well as the relationship between sustainability and legislative integration.
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Learners will understand how these systems interact to create a holistic approach to business transformation.

Learning Objectives:

- Understand the interconnectedness of digitalization, sustainability, and legislation.
- Learn how digital technologies can enable sustainability and regulatory compliance.

Topics Covered:

1. *Digitainability*

- The scope and impacts of the double transition for SMEs: Understand how the dual challenge of integrating both sustainability and digitalization can lead to innovation in small and medium enterprises (SMEs).
- Key digital tools for environmental and social responsibility impact monitoring: Explore technologies such as AI, IoT, and blockchain that help track and report environmental and social impacts in fashion supply chains.
- Enhancing sustainability through technology adoption: Learn how digital tools can facilitate the implementation of circular economy practices and improve overall sustainability.

2. *Regulations for Sustainability*

- From non-regulated to regulated sector: Why sustainability regulations have emerged: Investigate the forces behind the growing regulatory environment and how fashion companies have shifted from voluntary sustainability measures to mandated ones.
- The legislative landscape and priorities in the fashion industry: Overview of the key EU regulations impacting the fashion sector, including the Corporate Sustainability Reporting Directive (CSRD) and Ecodesign for Sustainable Products Regulation (ESPR).
- How to integrate regulations into business strategy for a competitive advantage: Explore the potential for businesses to turn compliance with regulations into a strategic differentiator.

3. *Digital Technologies for Normative Integration*

- Understanding digital technology regulations: A deep dive into the regulations governing digital technologies in Europe, such as the Digital Services Act (DSA) and the Digital Markets Act (DMA).
- Going beyond compliance: Building regulatory integration through digitalization: Learn how businesses can use digital tools not just for compliance but to enhance operational efficiency and drive innovation.
- Evaluating the social and environmental impacts of digital technologies: Assess how the digital tools used in the fashion industry can both positively and negatively impact sustainability and ethics.

Module 3: Innovative Business Models for Sustainable Fashion

This module examines the innovative business models emerging in the fashion industry, with a focus on digitalization and sustainability. Learners will analyze successful case studies and learn how to create business models that respond to the industry's evolving challenges.

Learning Objectives:

- Understand the latest innovative business models in fashion.
- Develop the skills to create new, sustainable business models through technology and regulation integration.

Topics Covered:

1. *Current Innovative Business Models*

- Overview of innovative business models in fashion: Explore business models such as direct-to-consumer (DTC), circular fashion, and digital fashion that are gaining traction in the industry.

	• Strategic value of these models: Discuss the advantages of these models in achieving sustainability and digital transformation goals, with a focus on cost reduction, customer loyalty, and market differentiation. 2. <i>Case Studies of Successful Business Model Transformations</i> • Examining case studies of companies that successfully transformed through technology and legislative integration: Learn from real-world examples of companies that have successfully adapted their business models to be more sustainable and digitally integrated. 3. <i>Business Model Creation Workshop</i> • Hands-on workshop to design new business models focused on sustainability and digitalization: Engage in a practical exercise where learners will create a business model addressing a current issue in the fashion industry. 4. <i>Strategic Benefits of Industry Pioneers</i> • Exploring the advantages gained by early adopters: Analyze how leading companies in the fashion industry have gained strategic advantages by adopting innovative, sustainable, and digital-first business models. Module 4: Roadmaps for Materialization This module focuses on strategic pathways for integrating sustainability, digitalization, and legislative compliance into business operations. The emphasis is on using Design Thinking methodologies to develop actionable roadmaps and engage stakeholders effectively. Learning Objectives: • Apply Design Thinking to solve sustainability challenges in fashion. • Develop sustainability roadmaps for integrating digitalization and regulatory requirements. Topics Covered: 1. <i>Applying Design Thinking to Fashion Sustainability</i> • Using Design Thinking to address sustainability challenges: Understand how the human-centered approach of Design Thinking can help solve sustainability challenges in fashion and foster innovation. 2. <i>Developing Strategic Sustainability Roadmaps</i> • Step-by-step guidance for creating roadmaps that align sustainability with business objectives: Learn how to develop actionable strategies for integrating digital technologies and regulatory requirements into fashion businesses. 3. <i>Integrating Technologies and Normative Requirements</i> • Strategies for incorporating digital tools and regulatory compliance into daily operations: Explore how fashion businesses can effectively combine sustainability, technology, and regulations in their business practices. 4. <i>Stakeholder Engagement and Policy Alignment</i> • Engaging stakeholders across the value chain: Learn how to work with key stakeholders, including suppliers, policymakers, and consumers, to ensure alignment with sustainability goals and regulatory requirements. Module 5: Final Project: Creating a Sustainable Business Strategy In the final module, learners will apply everything they've learned to create a comprehensive business strategy that integrates sustainability, digital transformation, and regulatory compliance. They will present their final projects, receive expert feedback, and refine their strategies. Learning Objectives: • Integrate knowledge and skills from the course into a real-world business context.
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	- Receive expert feedback on the viability and strategic impact of the proposed business strategy. Topics Covered: <i>Business Strategy Creation</i> - Develop a business strategy for a real company, addressing its challenges and integrating sustainability, digitalization, and compliance. <i>Final Presentation and Expert Feedback</i> - Present the final business strategy to experts and peers, receiving feedback for improvement and refinement. Conclusion and Certification. Upon completion of the course, learners will have gained the practical skills and knowledge needed to lead and innovate in the intersection of sustainability, digital transformation, and regulatory compliance within the fashion industry. Learners will be awarded a micro-credential, recognizing their ability to implement Digitainability strategies in real-world business contexts.
Learning/teaching delivery formats	Incorporating innovative delivery formats can significantly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: ✓ Workshop ✓ Seminar ✓ E-book ✓ Playbook ✓ Videos ✓ Serious Game ✓ Case studies ✓ Augmented Reality (AR) applications ✓ Virtual Reality (VR) applications / Metaverse experience ✓ Coaching ✓ Shadowing ✓ Work Based Learning (WBL) ✓ Project Based Learning (PBL) ✓ Internship ✓ Others... please detail....
Type of assessment	✓ Project-based assessment - Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ Quizzes ✓ Presentations and demonstrations: students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ Reports on laboratory work/practical exercises ✓ Others... please detail....
Pathway for a Successful Learner	Upon completion of this micro-credential, learners will be able to: - Understand and apply sustainability principles: Align business strategies with global sustainability frameworks (e.g., the EU Green Deal, Circular Economy Action Plan) and integrate these principles into day-to-day business operations. - Leverage digital technologies: Use advanced digital tools, including data analytics, AI, and blockchain, to monitor and enhance sustainability efforts, ensuring compliance and driving innovation across business models. - Navigate sustainability legislation: Understand and integrate relevant sustainability regulations (e.g., CSRD, Ecodesign Regulation) into business decision-making processes, ensuring legal compliance while fostering competitive advantage.

	• Develop and implement innovative business models: Design sustainable business models that not only address industry challenges but also promote long-term profitability and positive environmental and social impact. • Communicate sustainability initiatives effectively: Articulate the value of sustainability strategies to internal and external stakeholders, strengthening brand positioning, consumer trust, and stakeholder engagement. This micro-credential equips learners with the skills, tools, and knowledge to proactively address challenges in the fashion industry. They will be positioned as leaders in sustainability-driven innovation and strategic compliance, capable of driving long-term impact and competitive advantage.
REFERENCES	1. Brown, J., Smith, A., & Taylor, K. (2022). <i>Digital sustainability: A new paradigm for the fashion industry</i>. Fashion Journal, 45(2), 123-135. 2. Zhang, L., & Li, X. (2021). <i>AI and circular economy in textile manufacturing</i>. Journal of Sustainable Textiles, 18(3), 89-102. 3. González, P., Martínez, D., & Rivera, L. (2023). <i>Regulatory compliance and its impact on fashion sustainability</i>. International Journal of Fashion Law, 12(1), 56-78. 4. European Commission. (2023). <i>The Green Deal and digital transformation</i>. Publications Office of the European Union. 5. Smith, R. (2021). <i>Sustainable innovation in fashion supply chains</i>. Sustainability Reports, 34(5), 233-247. 6. Patel, M. (2020). <i>Blockchain for transparency in the apparel industry</i>. Journal of Digital Supply Chains, 27(4), 312-329. 7. Jones, K. (2022). <i>Data-driven decision-making in sustainable fashion</i>. International Journal of Eco-Fashion, 19(2), 143-158. 8. Lee, C., & Kim, Y. (2023). <i>Consumer perception of digital sustainability</i>. Fashion & Society, 11(1), 98-113. 9. Thompson, B. (2021). <i>How legislation shapes eco-friendly business models</i>. Policy and Fashion, 7(3), 217-232. 10. Wu, H. (2022). <i>Digital twins and smart manufacturing in textiles</i>. Textile Engineering, 14(2), 76-91. 11. Wilson, D. (2020). <i>The future of smart textiles and compliance frameworks</i>. Textile Technology Review, 28(6), 203-219. 12. Martínez, A. (2023). <i>Sustainability standards in global fashion supply chains</i>. Journal of Corporate Responsibility, 16(4), 289-305. 13. European Parliament. (2023). <i>Digital strategies for a greener future</i>. Publications Office of the European Union. 14. McKinsey & Company. (2022). <i>State of fashion report</i>. McKinsey Global Fashion Insights. 15. Deloitte. (2021). <i>Compliance and sustainability in the apparel industry</i>. Deloitte Insights. 16. Fashion Revolution. (2023). <i>Transparency index and best practices</i>. Fashion Revolution Reports. 17. World Economic Forum. (2022). <i>The role of digitalization in sustainable development</i>. WEF Reports.

Title of the MICRO CREDENTIAL	Sustainable Smart Textiles: Printed Electronics for Fashion and Craft Innovation
Developer partner	Oamk – Oulu University of Applied Sciences
State of the Art	The integration of printed electronics into textiles is revolutionizing the fashion and textile industries by enabling the creation of lightweight, flexible, and functional garments. Unlike traditional electronic components, which rely on rigid circuit boards, printed circuitry involves the deposition of conductive inks and materials onto fabric substrates, allowing for seamless integration into wearable technology. Research by Stoppa & Chiolerio (2014) highlights the rapid advancements in printed electronics, emphasizing their potential in smart textiles, healthcare applications, and interactive fashion. One of the most significant advantages of printed electronics in textiles is their contribution to sustainability. The textile and fashion industries are notorious for their high levels of waste and resource consumption. Printed electronics present an opportunity to reduce waste by incorporating sensors and circuits directly into garments, minimizing the need for additional hardware and extending product lifecycles. According to a report by the Ellen MacArthur Foundation (2017), integrating smart functionalities into textiles can promote a more circular fashion economy by enabling recycling, reuse, and efficient energy management in wearables. Moreover, printed electronics support sustainable fashion by reducing reliance on traditional, resource-intensive manufacturing processes. Conventional electronic components require significant amounts of raw materials, including metals and plastics, which contribute to environmental degradation. Printed electronics, on the other hand, utilize conductive inks made from biodegradable or recyclable materials, lowering their environmental footprint. Studies such as those by Shanmugam et al. (2020) emphasize the potential of printed circuitry in promoting eco-friendly textile production and enabling innovative, sustainable business models within the fashion industry.
Objective/Aim of the course	By completing this micro-credential, participants will: • Understand the principles of printed electronics and their applications in textiles. • Explore the role of sustainable materials and processes in electronic textiles. • Develop skills in designing and printing functional circuits onto fabric substrates. • Learn how smart textiles can contribute to circular economy models in fashion and crafts. • Gain practical experience in testing and evaluating printed electronic garments for durability and functionality.
Prerequisites for users to start the course	To start in this course, participants should have: • A basic understanding of textile materials and production processes. • Familiarity with fashion, craft, or engineering principles. • An interest in sustainability and technological innovation in the textile and fashion industries. • No prior experience in printed electronics is required, but a background in design, engineering, or materials science is beneficial.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	8	2	5	5	3	23
Individual study hours	5	1	1	7	3	17
					Total hours	40
					Total ECTS	1,6
Learning outcomes- Knowledge and Skills	Knowledge: - Holistic understanding of the impacts of the double transition (green and digital) in the fashion industry. - Mastery of key regulations and relevant stakeholders in the legislative panorama. - Proficiency in digital technologies to enhance sustainability actions. - Understanding of legislative integration and sustainability driven business models, and the strategic advantage in the fashion industry. Skills: - The fundamentals of printed electronics and their potential in textiles and crafts. - Sustainable materials and eco-friendly manufacturing techniques for electronic textiles. - Methods for enhancing garment durability and reducing electronic waste. - The role of smart textiles in circular economy models. - Testing procedures for evaluating functionality and environmental impact.					
Syllabus	Course content - Introduction to Printed Electronics in Textiles Overview of printed circuitry and functional materials. Applications in fashion, crafts, and wearable technology. - Sustainability in Smart Textiles Biodegradable and recyclable conductive inks. Energy-efficient and low-waste manufacturing processes. Role of printed electronics in reducing textile waste. - Designing and Manufacturing Printed Circuits on Textiles Selection of sustainable textile substrates. Printing techniques for flexible electronics. Integration of sensors for smart garments (e.g., temperature or motion tracking). - Testing and Practical Implementation Durability and washability of printed circuits. Functionality testing in real-life applications. Ethical considerations and lifecycle assessment.					

Learning/teaching delivery formats (select what is suitable for your micro-credential)	Incorporating innovative delivery formats can significantly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: ✓ Workshop ✓ Seminar ✓ E-book ✓ Playbook ✓ Videos ✓ Serious Game ✓ Case studies ✓ Augmented Reality (AR) applications ✓ Virtual Reality (VR) applications / Metaverse experience ✓ Coaching ✓ Shadowing ✓ Work Based Learning (WBL) ✓ Project Based Learning (PBL) ✓ Internship ✓ Others... please detail....
Type of assessment (select what it is suitable for your micro-credential)	✓ Project-based assessment - Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ Quizzes ✓ Presentations and demonstrations: students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ Reports on laboratory work/practical exercises ✓ Others... please detail....
Pathway for a Successful Learner	Upon completion of this microcredential, learners will be able to: • Design and develop printed electronic circuits on textile substrates. • Utilize sustainable materials and processes in smart textile production. • Evaluate and optimize the durability and functionality of electronic textiles. • Implement innovative electronic textiles in fashion and craft applications. • Apply sustainability principles to electronic textile design and lifecycle management.
REFERENCES	Ellen MacArthur Foundation. (2017). <i>A new textiles economy: Redesigning fashion's future</i>. Ellen MacArthur Foundation. Retrieved from https://www.ellenmacarthurfoundation.org/publications/a-new-textiles-economy-redesigning-fashions-future Shanmugam, K., Vijayakumar, C., Ramakrishnan, S., & Venkatasubbu, G. D. (2020). <i>Printed electronics in smart textiles: Materials, manufacturing, and applications</i>. Journal of Materials Chemistry C, 8(22), 7561-7578. https://doi.org/10.1039/D0TC01539A Stoppa, M., & Chiolerio, A. (2014). <i>Wearable electronics and smart textiles: A critical review</i>. Sensors, 14(7), 11957-11992. https://doi.org/10.3390/s140711957

Title of the MICRO CREDENTIAL	Additive Manufacturing and 3D Printing for Sustainably Crafted Capsule Collections
Developer partner	TUIASI- Gheorghe Asachi Technical University of IASI
State of the Art	Additive manufacturing, commonly known as 3D printing, has become an important technology in many industries, including textiles. The main 3D printing methods include Fused Deposition Modelling (FDM), Stereolithography (SLA), and Selective Laser Sintering (SLS), each with different benefits in material variety, accuracy, and application. These techniques are used in fields such as healthcare, aerospace, and consumer products, showing their ability to create detailed designs while reducing material waste [1]. Unlike traditional manufacturing, which often involves cutting or moulding materials, additive manufacturing builds objects layer by layer, allowing for complex shapes and efficient material use. The textile industry has used these improvements for various purposes, from creative designs to functional applications. In the textile industry, additive manufacturing is changing fashion, technical textiles, and wearable technology. A significant application of 3D printing in textiles is in fashion design, where designers use it to create complex patterns and shapes that are difficult to achieve with traditional techniques [2]. Designers like Julia Koerner and Iris van Herpen have presented 3D-printed garments, demonstrating that these technologies can be included in high fashion [3]. Researchers have also studied the potential of 3D printing to make smart textiles with built-in sensors and conductive materials for wearable electronics [4, 5]. Beyond fashion, 3D printing has important uses in different textile domains, such as textiles for automotives, medical uses, and protective clothing. Additive manufacturing helps create high-performance textiles with better features such as heat resistance, durability, and antibacterial properties. For example, 3D-printed textiles are being developed for medical use, such as compression garments, prosthetic covers, and tissues [6]. Similarly, protective equipment, like fire-resistant fabrics and shock-absorbing materials, benefits from the precision and custom designs made possible by 3D printing. The use of 3D printing in industrial textiles also improves production efficiency, allowing for fast prototyping and on-demand manufacturing, reducing waste and storage needs. The sustainability aspect of 3D printing in textiles is another key advantage. Unlike traditional textile production, which generates large amounts of waste, additive manufacturing uses only the required materials, reducing environmental impact. Additionally, biodegradable and recycled materials are being developed for textile printing, promoting eco-friendly practices [7]. Material development is an important area in 3D-printed textiles. The current researchers that approach the testing of flexible materials like TPU (thermoplastic polyurethane) [8] will give printed textiles the stretchability and softness needed for additional comfort. Some techniques also combine traditional textile fabrics with printed components to improve durability and flexibility [9]. Another new use of 3D printing in textiles is the preservation of cultural heritage [10]. Artists and researchers can recreate detailed cultural patterns using digital models and 3D printing, ensuring traditional designs are kept alive while adapting to modern textile needs. This

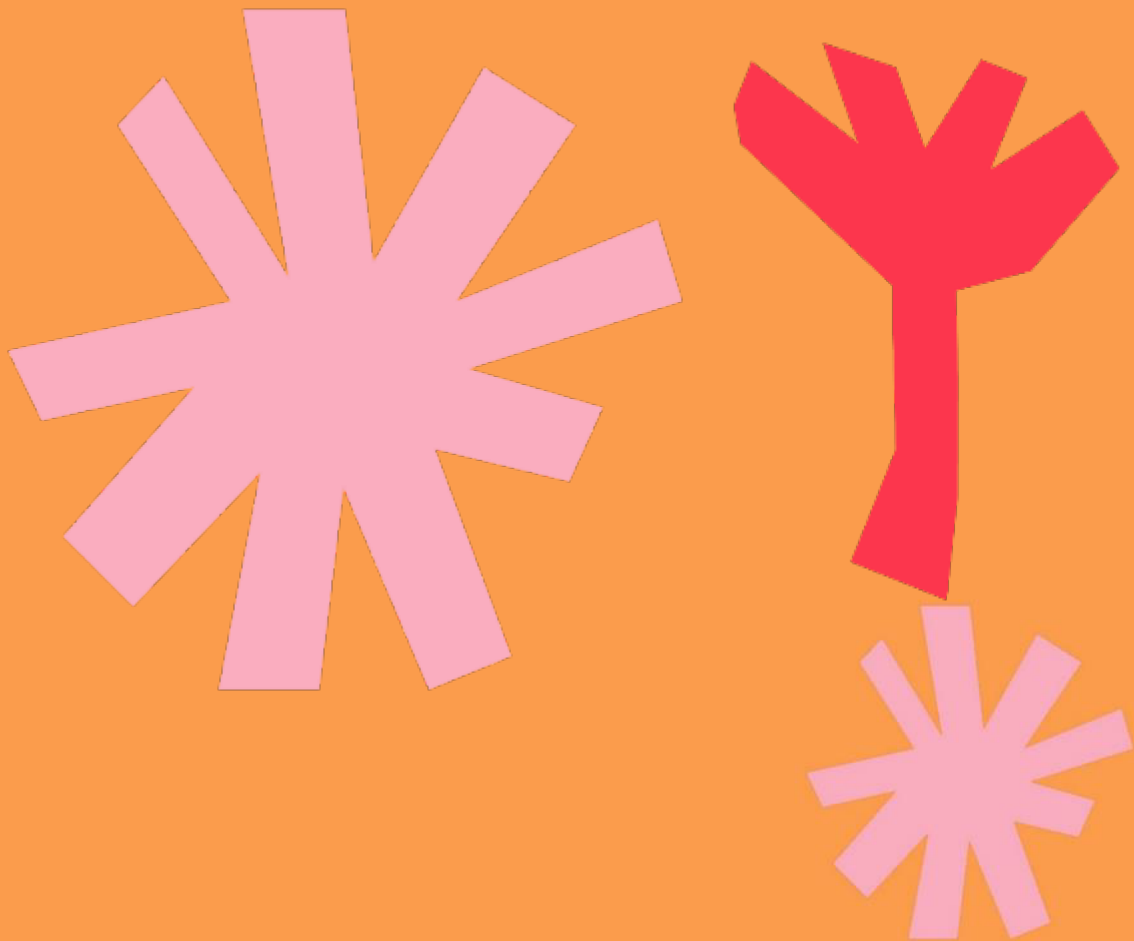
	method not only preserves cultural heritage but also creates new opportunities to merge traditional craftsmanship with modern manufacturing techniques [11, 12]. Despite the benefits, challenges remain in using 3D printing in textiles, particularly in large-scale production, cost efficiency, and material performance [13]. While improvements in multi-material printing and adhesion techniques have made 3D-printed textiles more viable, further studies are needed to make these technologies more suitable for mass production [14].					
Objective/Aim of the course	- To introduce additive manufacturing and 3D Printing and to highlight its role in creating sustainable fashion collections - To identify and experiment with sustainable materials used in 3D printing and their impact on fashion capsule collections. - To transfer and to provide hands-on experience in designing, prototyping, and producing sustainable capsule collections with 3D printing					
Prerequisites for users to start the course	To start this course, learners generally need to have some foundational knowledge and skills in the following areas: - Experience with CAD and modelling software - Understanding basic fashion design concepts - Knowledge of how fashion pieces are typically designed and produced.					
Workload	Lectures/ Webinars	Seminars	Project	Laboratory Practice	Course assessments	Total
Teaching hours	14		28	10	4	56
Individual study hours	14		28	10		52
					Total hours	108
					Total ECTS	4
Learning outcomes- Knowledge and Skills	Knowledge: - additive manufacturing and 3D printing technology - materials for 3D printing and their environmental impact - sustainable capsule collections based on traditional crafts and emerging technologies Skills: - to conceptualise, design and develop capsule collections with 3D printing technologies - to use digital tools for integrating crafts into a capsule collection - to select 3D printing materials for producing elements to be integrated into a fashion capsule collection - to evaluate sustainability in 3D Printed components for fashion capsule collections					
Syllabus	ADDITIVE MANUFACTURING AND 3D PRINTING IN SUSTAINABLE FASHION - Overview of sustainable challenges in the fashion industry/ Why are sustainability and innovation in fashion the key to the future? - Understanding 3D Printing in Fashion – types and materials used - How could 3D printing be integrated into the design process? - Integrating traditional craft with 3D Printing					

	• Case studies of sustainable capsule collections developed by TUIASI students • 3D printing of fashion accessories: handbags and shoes MATERIALS AND TECHNIQUES IN 3D PRINTING • Sustainable materials in 3D printing on textile fabrics- biodegradable filaments, recycled plastics, plant-based materials, etc. • How to select 3D printing materials for a capsule collection? • Environmental Impact of traditional materials versus 3D printed materials • How can sustainability in 3D printed components for fashion capsule collections be evaluated? • 3D printing techniques for fashion- multi-material, multi-layered, sustainable finishing • 3D printing improve functionality and reduce waste • Case studies on material innovations for 3D printing DESIGNING AND PRODUCING SUSTAINABLY CRAFTED CAPSULE COLLECTIONS USING 3D PRINTING • Conceptualise capsule collections with 3D printing – design concept, sustainable principles in design • Inspirations from crafts and traditional techniques • Prototyping the capsule collections: sketches, pattern making, 3D printing, cutting, sewing and finishing processes • Challenges and technical solutions on working with 3D printed components • Communicating the capsule collection • Practical session: Hands-on digital tools for integrating crafts into a capsule collection
Learning/teaching delivery formats	Incorporating innovative delivery formats can significantly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: ✓ Workshop ✓ In class teaching ✓ Seminar ✓ E-book ✓ Playbook ✓ Videos ☐ Serious Game ✓ Case studies ☐ Augmented Reality (AR) applications ✓ Virtual Reality (VR) applications / Metaverse experience ✓ Coaching ✓ Shadowing ✓ Work Based Learning (WBL) ✓ Project Based Learning (PBL) ✓ Internship ✓ Others... please detail....
Type of assessment (select what it is suitable for your micro-credential)	✓ Project-based assessment - Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ Quizzes ✓ Presentations and demonstrations: students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas

	✓ Reports on laboratory work/practical exercises ✓ Others... please detail....
Pathway for a Successful Learner	Additive technologies are rapidly growing in the textile industry, influencing fashion, sustainability, and functional textiles. With the development of new materials and printing techniques, 3D-printed textiles have the potential to transform the industry by offering customization, efficiency, and environmental benefits.
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