CRAFT IT 4 SD

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

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

D4.4 Playbook

CCSI for Sustainability

Operational Handbook for Replication

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1. Executive Summary

The present report constitutes the conceptual foundation for replicating and extending CRAFT-IT4SD's contributions to transforming Europe's Cultural and Creative Sectors and Industries (CCSI) into a key driver of the green transition. Throughout the project, CRAFT-IT4SD has explored how digital technologies, business models, legal and policy frameworks, learning communities, and Europe's rich living cultural and craft heritage can be leveraged to strengthen the sustainability, resilience, and innovation capacity of the CCSI. Through activities implemented across four European pilot ecosystems and the project's work packages, the consortium has generated knowledge, practical approaches, and transferable insights into how the CCSI can contribute to more sustainable development, in particular the fashion and textile sector.

To make these insights accessible and applicable beyond the lifetime of the project, the report synthesises them into five thematic development strands, each representing a distinct dimension of ecosystem development:

- New Business Models for Circularity and Sufficiency
- Green Legislation as an Innovation Catalyst
- Open Platforms for Collaborative Innovation and Data-Driven Services
- Learning Communities as Inclusive Structures for Capacity Building and Skills Development
- Living Heritage and Innovation as Continuity

Rather than presenting replication as the adoption of CRAFT-IT4SD as a whole, the report promotes a modular approach. Each development strand functions as a stand-alone conceptual resource, enabling policymakers, SMEs, educators, researchers, and other ecosystem actors to engage with the themes that are most relevant to their own context and development priorities. Each chapter explains the rationale behind the selected theme, illustrates how it was addressed within CRAFT-IT4SD, analyses the underlying principles and mechanisms, discusses important considerations for replication, and provides references to relevant project resources.

A central message of the report is that successful replication depends on adaptation rather than imitation. Different ecosystems operate under different economic, cultural, technological, and regulatory conditions, requiring context-sensitive approaches rather than the direct reproduction of specific project activities. Consequently, the report moves beyond describing what was implemented during CRAFT-IT4SD to identify transferable principles, frameworks, and lessons that can guide future initiatives while allowing flexibility for different circumstances.

The report also includes a dedicated chapter on ecosystem development factors identified and discussed by the consortium throughout CRAFT-IT4SD. The inclusion of this chapter reflects one of the project's central findings: developing sustainable CCSI ecosystems requires balancing multiple, and sometimes competing, priorities rather than following a single prescriptive pathway. To support this process, the chapter presents a non-exhaustive set of factors and considerations that highlight both the opportunities and potential risks associated with different development choices. For example, while CRAFT-IT4SD demonstrates that digital technologies can play an important role in revitalising cultural heritage and strengthening craftsmanship, their implementation requires careful consideration. When deployed appropriately, digital technologies can enhance creativity, preserve traditional knowledge, and enable more sustainable production and collaboration. Conversely, if implemented without sufficient attention to cultural, social, and creative values, they may contribute to the erosion of craftsmanship, cultural authenticity, and creative diversity. Similar trade-offs exist across other dimensions of ecosystem development, including business models, regulation, skills development, and sustainability. Rather than prescribing universal solutions, this chapter encourages ecosystem actors to critically reflect on these considerations when adapting or building upon the approaches developed through CRAFT-IT4SD.

This report represents the first step in CRAFT-IT4SD's broader replication strategy. Its conceptual guidance is complemented by additional dissemination and exploitation activities, including stakeholder engagement, exhibitions, an online repository of project resources organised according to the six development strands, and a self-assessment tool that helps ecosystem actors identify development priorities and navigate the most relevant methods and resources. Together, these outputs are intended to facilitate the continued uptake, adaptation, and application of CRAFT-IT4SD's results, supporting stronger collaboration across Europe's fragmented CCSI ecosystem and reinforcing its contribution to a more sustainable future.

2. Introduction

This report provides the foundation for the hands-on replication during the final phase of CRAFT-IT4SD and beyond, aimed at encouraging various audiences to engage with and leverage the results of CRAFT-IT4SD's journey, where we have worked towards advancing the green transition and positioning the Cultural and Creative Sectors and Industries (CCSI) as a key driver. Our focus is in particular on the revitalisation of living cultural heritage - knowledge, materials, techniques and practices, that can provide alternative pathways towards a circular economy. Emphasis is placed on higher-order circular strategies that seek to refuse and reduce overproduction and overconsumption within the dominant global linear business model, which over the past four decades has substantially increased the fashion and textile industry's carbon emissions while placing growing pressure on water resources, biodiversity, and other natural ecosystems.

CRAFT-IT4SD adopts a sufficiency-oriented approach to the circular economy, prioritising strategies such as reuse, repair, refurbishment, and product life extension. Rather than focusing primarily on recycling, the project emphasises keeping garments and textile products in use for as long as possible, thereby reducing resource consumption, waste generation, and the demand for new production. This approach calls for the revitalisation of craft and material knowledge embedded in cultural practices of use and reuse and for craft and material skills that may be tacit, outsourced or even lost to our current production ecosystems. However, the revitalisation of craft, material, and cultural practices does not aim at preserving or reverting to former states of production, but much rather to promote knowledges and skills which will support green, social, and business innovation as a continuation of – often local – material wisdom, intergenerational craft knowledge, and cultural values harbored in narratives of our textile heritage, spilling over in our language and wording, and in our embodied and emotional connection with garment and clothing as art, creativity and identity.

This revitalisation of craft, culture, and creativity we consider a differentiating factor which strongly informs our understanding of CCSI ecosystems as dynamic, relational, and long-term multi-actor environments that are more diverse in their depth and resilience when compared to industrial or pure innovation ecosystems. CCSI ecosystems are multi-helix organisations which besides institutional frameworks, technology infrastructures, and business models, also harbor memories, narratives, and practices across many actors. CCSI ecosystems are dynamic networks of relationships, where innovation emerges through interaction, and where non-formal, non-institutional connections between different actors play important roles in generating new pathways. This perspective has implications for how the dynamics between top-down and bottom-up experimentation are understood, as well as for how scaling, impact, and replication are approached. Instead of aiming for a single large-scale transformation, CRAFT-IT4SD pursued a series of smaller interventions and iterative activities within and across its four pilot ecosystems. These interventions are intended to be taken up, adapted, and combined in different contexts, allowing local initiatives to contribute gradually to broader systemic change.

As the European CCSI are fragmented across multiple sub-sectors and smaller-scale businesses (90%), they are also to a large degree artistically and aesthetically informed and practice-oriented rather than driven by business scaling. Consequently, linear scaling and transferring business models and innovation pathways between geographical contexts and local ecosystems are not necessarily a straight-forward process, when seeking to transform the CCSI toward the green transition. Therefore, replication in CRAFT-IT4SD is not understood as a copy-and-paste exercise, nor as a matter of directly testing and replicating already produced methods and results in new geographical and cultural contexts. CRAFT-IT4SD replication follows the methodological pillars of CRAFT-IT4SD of "design thinking" and "ecosystems as learning communities" in its replication pathways. This means that impact is achieved through engagement with relevant initiatives, networks, and organisations in an open collaboration and mutual learning processes, allowing for a flexible, bottom-up and dialogical approach. Our CRAFT-IT4SD replication process is designed to make the project's methodologies, knowledge, tools, practices and learnings accessible, transferable, and "workable" to other Cultural and Creative ecosystems across Europe. This approach is underpinned by our Design Thinking framework, allowing for cumulative learning through interconnections and recurrent loops of iterations, where results are presented as pieces of fabric that can be combined with local materials and shaped into forceful patterns and patchworks for sustainable business and innovation towards the green transition. As we stated in our methodological playbook (D2.2):

> What can travel across contexts is not the literal procedure of a method, but its epistemic function: to generate practice-near insight through co-creation, to connect local experimentation with systemic goals, to enable collective reflection across sectors and scales. This has practical implications for how future initiatives are designed. Rather than asking "can this method be repeated?", the more relevant question is "can the intent and logic of this approach be re-enacted in a new context?"[1]

CRAFT-IT4SD's 'ecosystem as learning community' approach means that we do not build new ecosystems for replication, but that we proactively sought out collaboration and alignment with existing cultural and creative ecosystems for whom engagement with CRAFT-IT4SD's methods, approaches and results could be beneficial. For this, we have largely relied on close collaboration with our sister-projects, and with EIT Culture & Creativity regional hubs, in particular the Co-location Centre North.

This understanding of replication has directly informed the structure of the present report. Rather than organising replication around the four pilot sites or the individual work packages, CRAFT-IT4SD distils the project's experiences into a set of thematic development strands that capture the principal mechanisms through which sustainability can be advanced within CCSI ecosystems:

- New business models for circularity and sufficiency

  Encouraging business approaches based on the circular economy, with a specific focus on repair, reuse, refurbishment which support responsible consumption, and long-term sustainability.

- Green legislation as innovation catalyst

  Understanding how to work with European legislation, strategies and policy frameworks as catalysts for innovation, circular practices, and sustainable value chains.

- Open platforms for collaborative innovation and data-driven services

  Exploring digital tools, open platforms, data resources, and immersive technologies that support more sustainable creative processes.

- Learning communities as inclusive structures for capacity building and skills integration

  Fostering collaboration and knowledge exchange while expanding the reach and actions across the ecosystem, among artisans, designers, SMEs, researchers, cultural organizations, public institutions, and other stakeholders.

- Living heritage and innovation as continuity

  Combining cultural heritage, craft knowledge, material understanding, and digital technologies to develop sustainable innovation and creative solutions.

Each strand represents a transferable pathway for ecosystem development, synthesising experiences from across the pilots into a coherent body of knowledge that can be interpreted and adapted within different cultural, institutional, and geographical contexts. The development strands therefore constitute the primary vehicle for replication within CRAFT-IT4SD. Instead of prescribing fixed solutions, they provide principles, approaches, practical examples, and critical considerations that enable ecosystem actors to select, combine, and adapt those elements that are most relevant to their own circumstances. In doing so, the report seeks to support modular and context-sensitive replication, recognising that sustainable transformation emerges through the continuous interaction between transferable knowledge and local capabilities, needs, and opportunities.

Structure of the Report

The main body of this report is organised into five chapters, each dedicated to one of the project's five development strands introduced above. Together, these strands and chapters capture the overarching objectives of CRAFT-IT4SD and reflect the areas addressed through the project's 4 pilot-sites and work package activities.

[1] "Participatory methodologies: How CRAFT-IT4SD built a collective approach for researching and innovating sustainable transitions in the European cultural and creative industries (CCSI)." See D2.2. Methods Playbook (Final), https://craft-it4sd.eu/results/

To ensure consistency and ease of navigation, each chapter follows the same structure (Figure 1). It begins by explaining the perspective that the CRAFT-IT4SD consortium has adopted with respect to the respective development strand. This conceptual framing serves two purposes. First, it explains why the theme is important for the development of CCSI-ecosystems. Second, it clarifies what CRAFT-IT4SD understands as meaningful development or progress in this area. For those seeking to replicate the project's approaches, understanding this underlying rationale is essential. Replication is not simply about reproducing activities but about understanding the purpose they serve and the direction of change they are intended to support. This framing therefore outlines the rationale behind the CRAFT-IT4SD initiatives, their relevance for CCSI-ecosystem development, and the broader questions they are designed to address.

Building on this outset, each chapter then presents the overall approach adopted by CRAFT-IT4SD to advance the respective development strand. Rather than merely documenting the activities undertaken throughout the project, the report analyses and structures these activities into practical frameworks that reveal the underlying logic, guiding principles, and methodological considerations. The objective is to equip future adopters with the necessary understanding to create comparable enabling conditions within their own ecosystems. In the context of CRAFT-IT4SD, replication does not mean copying individual actions or interventions one-to-one. Instead, it means adopting the reasoning, design logic, and implementation principles behind them so that equivalent structures, processes, and initiatives can be adapted to different regional contexts. Throughout the chapter, examples and use cases from the project illustrate and substantiate this analysis. This emphasis on *transferable* frameworks and principles, rather than prescriptive instructions, is one of the central contributions of this report.

The following section discusses the replication-relevant outcomes that can be achieved by following the described approaches. Importantly, rather than highlighting only the specific outputs produced within CRAFT-IT4SD, this section explains what the adopted approaches can achieve in a transferable sense. For example, the emphasis is not on presenting a particular business model developed during the project as something to be copied elsewhere. Instead, it examines how the project's activities strengthened the capacity for business model innovation, thereby enabling stakeholders in other ecosystems to develop solutions that respond to their own circumstances and needs. The concrete outputs and examples generated within CRAFT-IT4SD remain valuable resources that others may adopt, adapt, and build upon. However, the primary objective of this section is to explain what comparable outcomes CRAFT-IT4SD's approaches are meant to achieve and what capabilities or ecosystem functions these approaches are intended to strengthen.

Next, we provide a discussion of the key enabling factors that we consider essential for successfully implementing and replicating the presented approaches. These factors extend beyond describing what was done; they examine the foundational elements that made the approaches effective. They articulate the conditions and mechanisms that explain why the described approaches generated the described positive results. In doing so, they connect the initial conceptual framing with the practical approaches presented throughout the chapter and distil transferable lessons for those seeking to foster comparable forms of ecosystem development within their own regional contexts.
At the end of each chapter, readers will find a curated selection of CRAFT-IT4SD resources that provide additional detail on specific methods, approaches, and tools discussed throughout the chapter. These references are intended both as sources of further information and as inspiration for adapting similar approaches in different contexts.

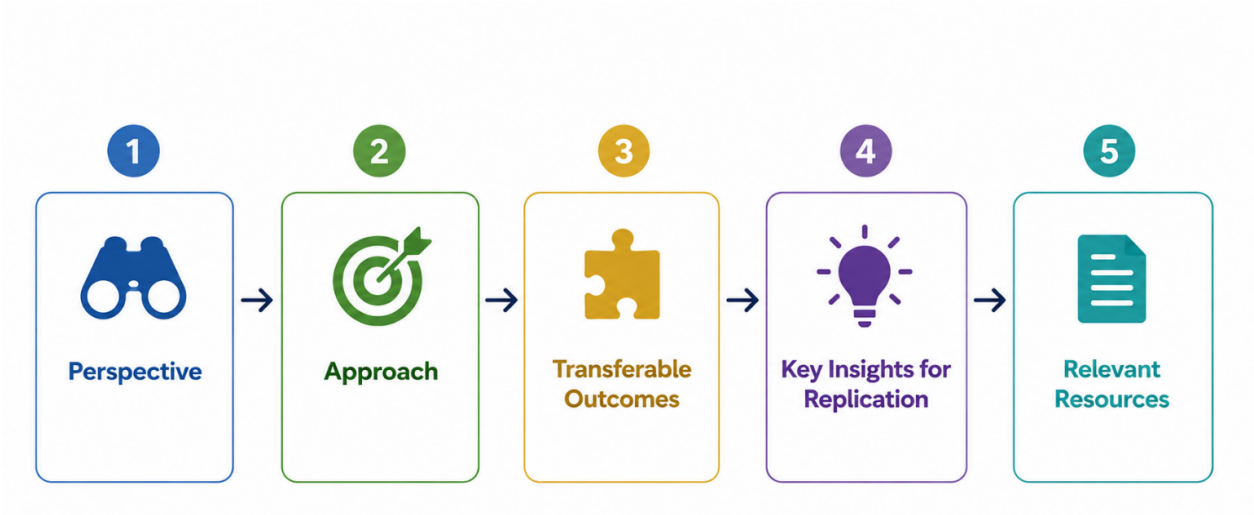

Figure 1: Guiding Structure of the Development Strand Chapters

This structure makes the playbook highly modular. While it is designed to be read as a coherent whole, individual chapters can also be used independently by readers who are interested in strengthening only particular aspects of their ecosystem. Moreover, the consistent structure of each chapter—moving from conceptual perspective, to approach, to replication-relevant outcomes, and finally to key enabling factors—allows readers to engage selectively with those elements that are most relevant to their own circumstances. Replication is therefore not presented as an all-or-nothing exercise. Rather, users are encouraged to adopt, adapt, and combine individual concepts, frameworks, and approaches according to their own priorities, capacities, and strategic objectives.

After the main body, this report includes a dedicated section presenting development-relevant factors identified throughout CRAFT-IT4SD. Rather than prescribing specific actions, these factors provide orientation on aspects that may influence the evolution of regional innovation ecosystems, acting as either enablers or barriers depending on how they are recognized and addressed.

This playbook represents only the first—and foundational—step of CRAFT-IT4SD's broader replication strategy. Its primary purpose is to organise, analyse, and synthesise the project's experiences into a coherent conceptual framework for replication. Building on this foundation, CRAFT-IT4SD will develop a complementary repository of practical resources that supports hands-on implementation. This repository will provide access to methods, tools, templates, and examples that enable practitioners to translate the principles presented in this playbook into concrete actions.
To further support this process, the repository will be complemented by a self-assessment tool. Based on the five thematic development strands, the tool will enable ecosystem actors to assess the maturity of their own ecosystems, identify strengths and development needs, and navigate the available resources according to their specific priorities. Together, the playbook, resource repository, and self-assessment tool form an integrated replication support system that combines conceptual guidance with practical implementation resources, allowing stakeholders to tailor the replication process to the unique characteristics of their own regional ecosystems.

3. New Business Models for Circularity and Sufficiency

This pathway focuses on the development of new approaches to business within CCSI, particularly in the form of sustainability-driven business modeling and value creation.

Target Groups: Local and Regional CCSI-ecosystems; Business and Innovation Clusters; Local and Regional Authorities; Local and Regional Business Chapters; Policy Makers

Perspective

An important lever for advancing the European economy toward competitiveness while promoting sustainable resource use and greater resilience lies in exploring new ways to do business. This includes revisiting established conventions around the production and consumption of goods and services. A long period of innovation and stable global trade has enabled unprecedented efficiency, making it possible to offer an ever-increasing selection of products at high volumes and low costs. However, it is evident that this model of production and consumption is not limitless and comes with significant negative environmental and social consequences.

This is particularly apparent in the fashion and textile industry, where the production of new garments is highly resource-intensive, requiring substantial amounts of raw materials, energy, water, and chemicals (see D5.1 - Mapping and descriptions of current business models in selected pilot sites, D5.2 - Climate impact assessment of current business models in the pilot sites). At the same time, clothing is often used only briefly before being discarded, driven by its widespread availability, low prices, and rapidly changing fashion trends. Globalized supply chains and intense cost pressures can contribute to precarious working conditions and unequal distributions of value across the sector. As a result, products circulate for increasingly shorter periods before being discarded, while the environmental and social costs associated with their production continue to accumulate. This dynamic is largely driven by **dominant business models** that prioritize high turnover, continuous consumption, and cost minimization over durability, repairability, fair value distribution, and long-term value creation.

To move away from these unsustainable patterns, business models must evolve beyond a narrow focus on economic performance and incorporate responsibility for the environmental and social impacts they generate. A key pathway promoted by the European Union through legislation and ambitious strategies is the transition towards a circular economy, which seeks to align economic value creation with broader sustainability objectives (European Commission, 2025b, 2022, 2020). In 2023, about 5 million tonnes of clothing and footwear are discarded within the EU, and globally less than 1% of material used to produce clothing is recycled into new clothing (European Commission, 2023). By keeping existing products and materials in use for longer and minimizing waste, circular economy principles aim to overcome the limitations of the prevailing linear model of production and consumption. Realizing this transition requires business models to adopt a broader, systems-oriented perspective that integrates economic, environmental, and social dimensions of value creation. Building on the recommendations from the Draghi and Letta reports (Draghi, 2024; Letta, 2024), the European Commission is advancing the forthcoming Circular Economy Act to establish a single market for secondary raw materials, increase the supply of high-quality recycled materials, and stimulate demand for these materials across the EU (European Commission, 2025c). As such, business model innovation represents a critical lever for advancing circularity and supporting the broader sustainability transition.

The growing adoption of circular business models and business model elements by established fashion companies demonstrates that these approaches are increasingly becoming part of the industry's strategic direction. Companies such as Patagonia, Levi's, The North Face, Zalando, Airpaq, and H&M have introduced initiatives including repair services, resale platforms, garment take-back schemes, rental, and product remanufacturing to extend product lifetimes and improve resource efficiency (H&M Group, 2026; Patagonia Worn Wear®, 2026; Levi Strauss & Co., 2026; Airpaq GmbH, n.d. The North Face, n.d.; Zalando, 2021) While these initiatives differ in ambition and do not necessarily replace companies' core business models, they signal a broader shift towards integrating circular and, in some cases, sufficiency-oriented principles into mainstream fashion business practice.

CCSI actors are particularly well positioned to drive this transformation, as they influence cultural narratives, consumer preferences, and lifestyles, meaning they can help redefine what is valued and consumed within society. Moreover, they often draw on rich cultural heritage, experiment with local materials, traditional knowledge, and craft-based production methods, many of which embody principles of durability, resourcefulness, local production, and long product lifetimes. When combined with emerging, digital technologies, innovative approaches to business and strong open ecosystems, these aspects can provide a powerful foundation for developing new forms of value creation that support circularity and sufficiency. Recognizing this potential, CRAFT-IT4SD adopts an integrative perspective on business model innovation that explores pathways through which sustainability-oriented forms of value creation can be combined with digitalization and cultural heritage, craftsmanship, and creative skills to turn the CCSI into a key driver for the sustainability transformation. The following sections build on this perspective by presenting practical approaches, transferable lessons, and enabling factors that support the replication of sustainability-oriented business models across diverse CCSI ecosystems.

Approach

Conventional business modelling typically starts from the question of how customer needs can be identified and satisfied, with sustainability considerations often incorporated only subsequently as constraints or market differentiators. In contrast, the approaches followed within CRAFT-IT4SD adopt a sustainability-first perspective. Rather than asking how sustainability can be integrated into existing value propositions, they explore the inverse question: What would business models look like if sustainability objectives constituted the starting point for their design? This shifts the focus towards understanding how economic viability can be achieved while simultaneously reducing environmental impacts and generating positive social outcomes. It also raises important questions regarding the practical constraints, trade-offs, and enabling conditions associated with implementing such models in real-world contexts.

While sharing this sustainability-first perspective, two pathways within CRAFT-IT4SD that differ substantially in how they inform business model transformation.

The first pathway is characterized by a more top-down and conceptual orientation, beginning with analyses of sustainability challenges and the industry landscape before developing and evaluating alternative business model concepts. This logic closely resembles what can be described as a **causation approach**, where desired directions are defined first and relevant concepts are subsequently developed (Sarasvathy, 2001). Within CRAFT-IT4SD, this proved particularly useful for facilitating discussions from multiple perspectives and enabling research and strategic reflection.

The second pathway follows a more bottom-up and experimental logic. Rather than starting from predefined directions and concepts, it begins with existing resources, capabilities, and stakeholder relationships, and explores how these could be recombined and developed into commercially viable opportunities that contribute to sustainability objectives. This resembles the concept of **effectuation**, where opportunities emerge through iterative experimentation and learning rather than detailed upfront planning (Sarasvathy, 2001). Depending on the context, each pathway offers distinct advantages. The top-down approach is particularly suited to strategic planning, policy development, and the design of new sustainability-oriented business model archetypes, while the bottom-up approach is well suited for informing the iterative development of solutions based on local needs and capabilities.

The value of this replication strand therefore lies not only in the specific business model concepts and tools developed, but also in the comparison between these complementary pathways and their differences from conventional business development practices. Together, they provide insights into the opportunities, limitations, and contextual conditions associated with sustainability-oriented business model innovation, helping practitioners understand which approaches may be most suitable for different purposes and circumstances.

Pathway One: Crafting Business Models for Sustainability

The first approach, illustrated through the work of VTT and MODACC, followed a structured and iterative process that combines empirical research, sustainability assessment, business model generation, and evaluation. It is characterized by an integrative, bird's-eye perspective that seeks to understand the broader sustainability and business

landscape before moving towards business model development. Building on a strong conceptual and empirical foundation, the approach adopts a predominantly causal, top-down logic, using insights from research, stakeholder engagement, and sustainability assessments to inform the generation and assessment of potential new business model concepts for the fashion and textile industry. This approach is particularly suitable for organisations seeking to systematically explore and design sustainability-oriented business models based on empirical evidence, stakeholder insights, and strategic analysis.

Mapping the Foundation

The process began by establishing both a conceptual and empirical understanding of sustainability-oriented business models.

This involved an extensive review of the literature on sustainability and business modelling, which provided the project's guiding sustainability framework and shaped the understanding of how sustainability within the sector can be advanced through business model innovation (Figure 2). The review highlighted the importance of placing greater emphasis on sufficiency as a key dimension of circularity, which fundamentally reshapes how value is created, delivered, and consumed. Sufficiency-oriented business modelling aligns with the highest levels of the EU waste hierarchy and seeks to reduce resource use by avoiding unnecessary production and consumption while extending the useful life of products and resources (European Commission, 2018). In practice, this involves prioritizing strategies that rethink existing consumption and production patterns, reduce overall resource use and unnecessary consumption, and, at the highest level, refuse forms of production and consumption that generate disproportionate environmental and social costs. Rather than simply meeting existing demand more efficiently, such approaches seek to reshape demand itself and encourage more sustainable forms of consumption and value creation.

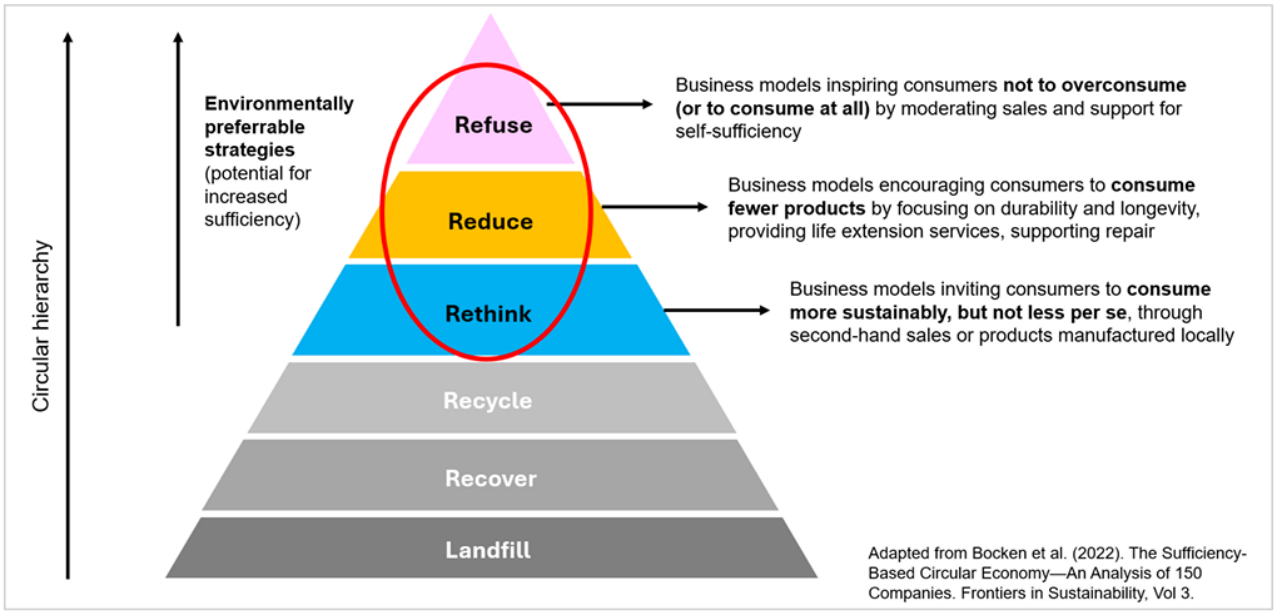

Figure 2: Hierarchy of Sufficiency-Oriented Strategies (Source)

The conceptual review was complemented by surveys and interviews with industry experts and business practitioners from across all CRAFT-IT4SD pilot sites to generate an understanding of how sustainability is currently addressed in practice. The empirical research provided an overview of the current state of the fashion and textile sector and identified important contextual factors, including the diversity of regional conditions across Europe (Markkula et al., 2025). Consequently, this phase ensured that subsequent activities were not only informed by the broader sustainability challenges and opportunities observed within the sector but also remained sensitive to the practical realities of different regional and organizational contexts.

Beyond providing an empirical foundation, the initial analysis also generated a set of themes that guided subsequent workshops and development processes. These included: **(1) comparative rigor**, ensuring impacts are assessed against appropriate alternatives; **(2) consumption reduction**, prioritizing the avoidance of virgin resource use and unnecessary production; **(3) technology as an enabler**, evaluating digital solutions based on their net sustainability contribution; **(4) holistic operational assessment**, balancing environmental, economic, and user considerations; and **(5) holistic sustainability assessment**, accounting for broader impacts, trade-offs, and rebound effects.

Finally, to move from understanding the current state of the sector towards envisioning future alternatives, the phase concluded with a series of workshops conducted across the pilot regions to explore aspirations and alternative pathways for integrating sustainability into the fashion and textile business. Bringing together diverse fashion and textile ecosystem actors, the workshops aimed to identify opportunities for business model redesign, assess potential positive and negative impacts, and surface conflicting stakeholder values. Adapted from Bocken et al.'s (2013) Value Mapping Tool for Sustainable Business Modelling, discussions were structured around four perspectives: the environment, consumers, network actors, and society and culture (see Markkula et al., 2025).

Understanding Impact

While sustainable business models have received increasing attention in the literature, relatively little work has focused on quantifying their climate impact reduction potential. The approach followed in CRAFT-IT4SD addresses this gap by incorporating analytical assessments of climate impacts through carbon footprint calculations. This reflects the principle that sustainability-oriented business modelling should be informed not only by normative aspirations and stakeholder perspectives, but also by **evidence regarding actual environmental outcomes**. Though not exhaustive, such assessments serve as an important reality check, helping to validate assumptions, identify unintended impacts, and ensure that proposed business models contribute meaningfully to sustainability objectives.

Given the complexity of assessing sustainability impacts across diverse business models, Life Cycle Assessment (LCA) was chosen as a pragmatic and standardized method focused on evaluating potential climate impacts. By examining environmental impacts across the entire life cycle of a product or service, LCA provides a systematic basis for assessing sustainability from a climate perspective.

Building on the initial mapping phase, four micro-enterprises and SMEs experimenting with sufficiency-oriented business strategies and business models were selected from across the CRAFT-IT4SD pilot sites as case studies for the assessment. In line with the **principle of comparative rigor**, the selection aimed to capture a diverse range of sufficiency-based business model types while ensuring representation from each of the four pilot regions. Based on their available data, analyses were conducted by VTT experts following the ISO 14040 standard (for details see CRAFT-IT4SD deliverable D5.2 - Climate impact assessment of current business models in the pilot sites).

The results demonstrated that assumptions about the sustainability of particular solutions do not always correspond to their actual environmental performance, for instance, due to rebound effects. At the same time, they consistently highlighted the importance of extending product lifetimes as one of the most effective strategies for reducing the climate impacts of the fashion sector.

Developing Business Models

Building on the insights generated through the preceding research activities, the process moved into the development of new business model concepts. Through an iterative combination of desk research, continuous scanning of secondary sources - including social media, fashion-related websites, webinars, expert contributions, and consumer insights - together with workshops, collaborative discussions, and future-oriented reflection, alternative ways of creating, delivering, and capturing value were identified, explored, and translated into business model concepts.

An important prerequisite for facilitating this integration is the availability of a framework that can adequately capture and organize the different dimensions involved. Business model canvases are commonly used for this purpose. However, traditional frameworks, such as Osterwalder's Business Model Canvas, were developed primarily for conventional business model innovation, placing strong emphasis on customer needs, value propositions, and economic viability, while giving limited attention to environmental, social, and cultural sustainability considerations.

Although a number of sustainability-oriented business model canvases have emerged in recent years, no existing framework was identified that adequately combined the specific dimensions central to CRAFT-IT4SD, namely sustainability, cultural heritage, and digitalization. Consequently, this phase involved the development of a dedicated business model canvas tailored to the project's objectives.

The resulting framework was explicitly designed to integrate cultural dimensions alongside economic, environmental, and social sustainability considerations, while also accounting for the role of digital technologies (Figure 3). It builds on elements of existing business model canvas and extends them to incorporate both cultural and digital aspects. This enables a more systematic exploration of how sustainability-oriented business models can leverage digitalization as an enabler while simultaneously drawing inspiration from, preserving, or contributing to cultural heritage and craftsmanship. The inclusion of cultural sustainability is particularly noteworthy, as this dimension remains largely absent from existing business model frameworks and is of central importance for CCSI.

The framework was deliberately kept simple and accessible to support the early stages of business model ideation and conceptualization, where flexibility, openness, and ease of use are particularly important. By providing sufficient structure to guide discussions without constraining creativity, the canvas allows diverse stakeholders to engage with complex sustainability challenges while maintaining the freedom to explore alternative directions and emerging opportunities.

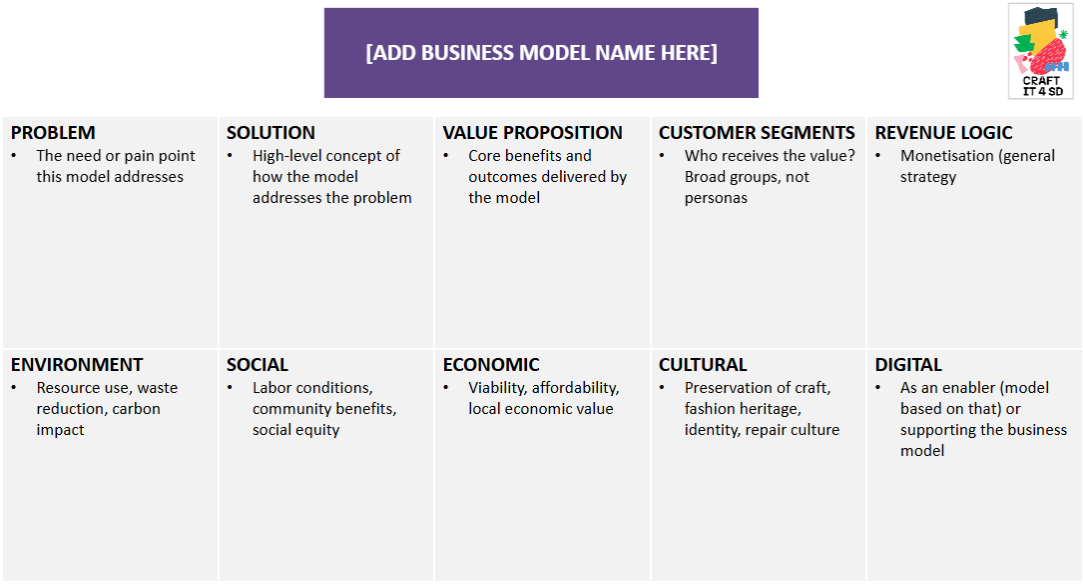

Figure 3:Template for generating sustainability-oriented business models

Using the developed business model canvas as a structuring framework, the insights generated throughout the research process were translated into six business model concepts that represent different commercial pathways for advancing sustainability through **consumption reduction** within the fashion and textile industry. Rather than constituting fully finalized and universally applicable solutions, these models should be understood as conceptual blueprints and starting points for further entrepreneurial experimentation, refinement, and adaptation to specific market conditions and regional contexts.

Consequently, the primary value of the generated business models lies not in providing ready-made answers, but in **illustrating archetypical mechanisms and strategic directions through which business models can contribute to circularity and help transform CCSI into a driving force for sustainability.** Grounded in the accumulated empirical and conceptual insights generated throughout the project, three particularly promising directions for sufficiency-oriented business innovation were thus identified:

- Extending the physical and emotional durability of products through repair, upgrading, and customization.
- Aligning production more closely with actual demand to reduce overproduction and waste.
- Identifying, organizing, and recirculating underutilized products and materials back into circulation.

These strategic directions find expression in the resulting business models through their integration with elements of cultural heritage and digitalization (FigFigure 4). Cultural heritage, craftsmanship, and creative skills frequently serve as **key resources** that enable and strengthen the underlying sustainability mechanisms, for example by supporting repair, customization, local production, or the revitalization of traditional practices. At the same time, they often fulfil an important **social function** by fostering knowledge exchange, community building, identity formation, and the transmission of skills across generations. Digital technologies have the potential to complement these assets by **enabling coordination, visibility, customization, and traceability**, thereby helping to increase the accessibility, transparency, and scalability of sustainability-oriented business activities (see D3.2 - Technology scan report for the sustainable transformation driven by the CCSI).

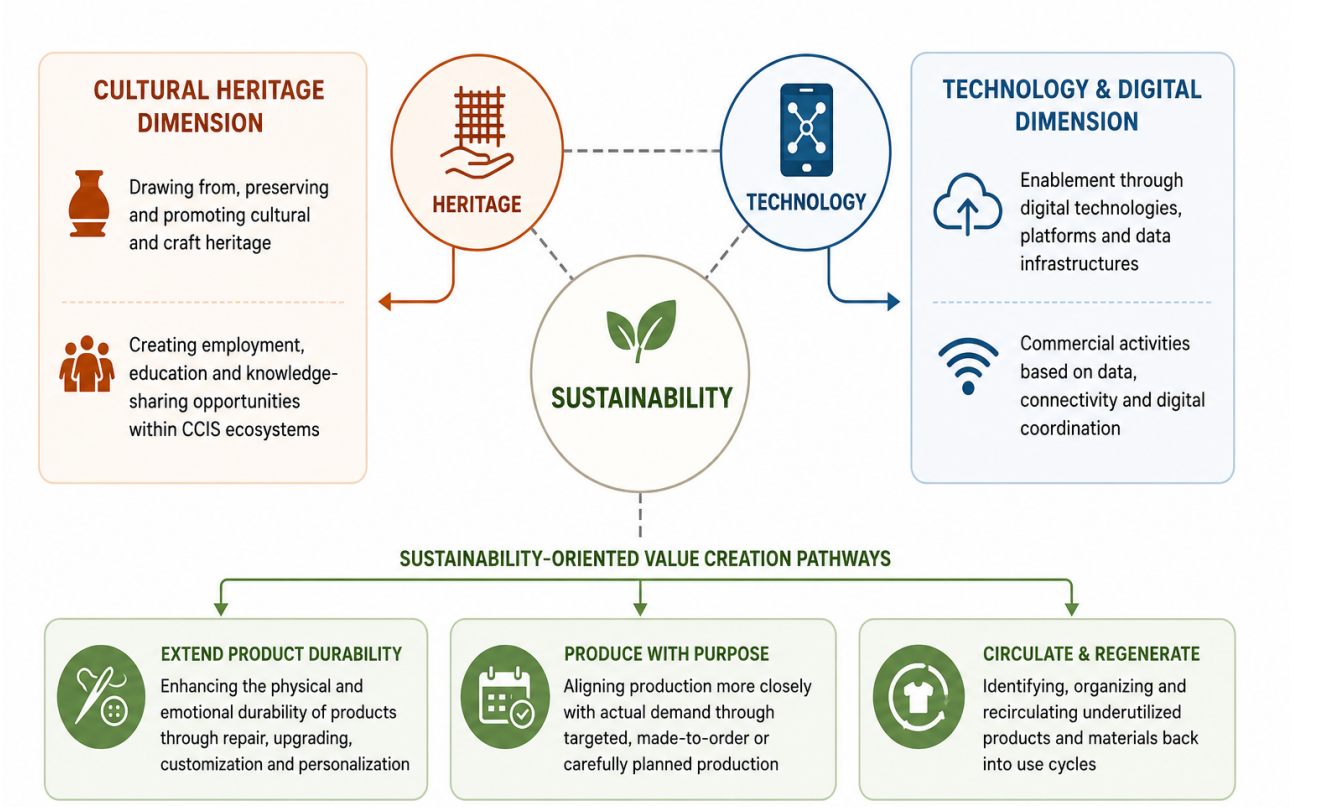

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Figure 4: Strategic directions for sufficiency-based business models

The six business model concepts that resulted from this process combine and operationalize the identified elements in different ways. While some primarily focus on extending product lifetimes through repair, customization, and maintenance services, others seek to improve the circulation of existing garments and materials or align production more closely with actual demand. Together, they demonstrate how principles of sufficiency and circularity can be translated into commercial activities through varying integration of cultural heritage, craftsmanship, creative capabilities, and digital technologies.

Assessing Business Models

A key strength of this causation-oriented approach to business modelling lies in its ability to enable a **holistic and evidence-based assessment** of the resulting sufficiency-oriented business model concepts. Grounded in a robust empirical and conceptual foundation, the generated business models make explicit not only the individual elements required for value creation and delivery, but also the links between them. This allows both the components themselves and the assumptions linking them to be systematically examined against the previously identified sustainability challenges, stakeholder needs, and organizational realities.

The value of this approach therefore lies not only in generating business model concepts, but in making their underlying logic visible and discussable. By explicitly articulating how sustainability mechanisms, value propositions, customers/stakeholders, technologies, and revenue models are expected to interact, the approach creates opportunities for critical reflection on whether the proposed concept is viable and capable of delivering the desired outcomes.

Accordingly, the final phase of this approach focused on evaluating the generated business model concepts through **multiple lenses** to identify critical barriers, weaknesses, trade-offs, and contextual constraints, while also revealing potential opportunities and enabling conditions. Beyond assessing the business models themselves, the objective was to better understand the conditions under which sufficiency- and circularity-oriented business models can succeed. The resulting insights are relevant both for entrepreneurs seeking to develop viable business opportunities and for policymakers, intermediaries, and governance actors seeking to create supportive framework conditions for sustainability transitions.

Evaluation was conducted through a **multi-stage process** combining qualitative and quantitative methods. The evaluation approach drew on established business model evaluation methods from the literature while accounting for the early-stage and conceptual nature of the generated business models. Consequently, qualitative methods formed the primary basis for feedback collection and refinement.

Throughout the development process, emerging business model ideas were continuously discussed and refined through a series of internal workshops spanning more than a year. Once the concepts had been consolidated into six business model drafts, a first round of external evaluation was conducted through two online workshops involving fashion and textile ecosystem actors from across the pilot sites and beyond. Participants included representatives of SMEs, fashion consultancies, industry associations, research and technology organizations, higher education institutions, and sector networks. Using the CRAFT-IT4SD business model canvas as a discussion framework, participants assessed the strengths and weaknesses of each concept and contributed ideas for further refinement and potential spin-off models.

Following these revisions, a second round of qualitative evaluation was conducted within the pilot regions through interviews and workshops with local micro-, small-, and medium-sized fashion businesses. This phase focused on assessing the relevance, applicability, and implementation potential of the business models within different regional contexts. To explore their transferability across locations, a final cross-pilot workshop was organized during a CRAFT-IT4SD consortium meeting.

To complement these qualitative assessments, two quantitative surveys were conducted. The first targeted business leaders and experts within the fashion and textile sector and invited them to assess the business models with regard to their ability to address key industry challenges, their scalability, financial sustainability, and their contribution to circularity and societal value creation. The second survey focused on potential users and consumers, primarily students across the pilot countries. It explored perceptions of relevance, innovativeness, willingness to use, and potential barriers to adoption, thereby providing insights into likely market reactions to the value propositions embedded in the business models. Together, these evaluation activities provided complementary perspectives from both the supply and demand side, enabling a more comprehensive assessment of the practical potential, acceptance, and implementation conditions of the proposed sustainability-oriented business models.

Transferable Development Outcomes

The presented approach follows a highly structured and research-driven method for developing sustainability-oriented business models. It follows a predominantly causal logic, beginning with extensive literature reviews, empirical mapping, sustainability assessments, and stakeholder engagement before generating and evaluating business model concepts.

There are two overarching replication-relevant outcomes. First, **the approach itself represents a viable blueprint for top-down, sustainability-driven business model development.** Because its core stages are not sector-specific, it is highly transferable across industries and regional contexts. This is particularly relevant for addressing sustainability challenges, which typically require a holistic perspective and a broad knowledge base. Individual actors often operate from a single perspective, such as economic viability, and may lack the incentives, capabilities, or information necessary to adequately consider wider environmental and social implications. As a result, important

sustainability dimensions and potential trade-offs can easily be overlooked. By placing sustainability evidence at the centre of business model development, the approach provides a structured means of exploring and evaluating alternative value-creation mechanisms from multiple perspectives rather than treating sustainability as an afterthought.

Second, the findings generated through CRAFT-IT4SD constitute **a valuable knowledge base for others working on enhancing circularity and sufficiency** in a business context. Beyond the methodological contribution, the project identified and discussed key business model elements and strategic directions for advancing sufficiency-based business models, as well as insights into how these can be effectively combined (FigFigure 4). While these insights are documented in greater detail across the project deliverables, they are ultimately synthesized into six business model concepts that illustrate pathways towards more sustainable forms of value creation. A brief overview is provided below to illustrate how the identified strategic directions are translated into concrete business model concepts.

- **Repair cafe – commercially operated:** This business model invites people to bring their damaged fashion items for repair, modification, or DIY project. Items are fixed with professional guidance with all the needed materials included.
- **CraftedForMe – When craft meets microfactory innovation:** A hybrid, scalable factory-and-service concept that combines local micro factory-produced base garments with craft-based customisation. Locally produced base products manufactured in micro factories. Digital tools, including AR/AI fitting and body scanning, to support better fit.
- **Fashion Declutter – Externalising wardrobe clean-up:** A professional fashion decluttering service delivered directly to your home, featuring an expert who organises garments for optimal circulation. Items are systematically sorted, arranged, and priced for resale, reuse, or recycling. Garments can also be sold on behalf of the client.
- **Curated Rewear – Second-hand style, curated and searchable. Fast:** A next-generation second-hand shop (online+offline): curated, searchable, organised, time-saving, and visually appealing – built around your purpose and style. Specialises in a specific category, lifestyle and/or use occasion: e.g. street-athletic sportswear, classic womenswear, childrenswear etc. Consistent assortment via multi-stream and selective sourcing: consumer consignors, brands, and AI-driven sourcing.
- **Crafting Virtual Style – style crafted in pixels, made on demand:** Emerging fashion designers can team up with a gaming studio to start their design career in order to bring stability as an emerging designer before the breakthrough. The digital gaming designs (skins) can be purchased physically through on-demand-manufacturing, thus, tackling the overproduction. Through games fashion can be enjoyed digitally rather than physically.
- **Clothing Repair Chain – repair easily accessible:** Modernised branded repair service offering chain where smaller companies can easily offer their services: standardised mending, tailoring, and upcycling. External operator located near brand or other retail stores. Repairing becomes mainstream and part of the consumer awareness.

Importantly, the resulting business model concepts should not be viewed solely as **potential blueprints for future ventures**. They also serve as valuable research and discussion tools that can help identify potential strengths, but also weaknesses, adverse effects, and implementation challenges at an earlier stage of development from multiple perspectives. In doing so, they also draw attention to **the role of external factors** - such as regulatory frameworks, market structures, consumer behaviour, and technological developments - in shaping the viability and impact of sustainability-oriented business models. As such, the primary contribution of these concepts lies not only in the business opportunities they suggest, but also in their ability to support dialogue and informed decision-making regarding the transition towards more sustainable forms of value creation.

Key insights for Replication

From a replication perspective, the objective is not to copy the specific business models generated through the illustrated approach, but rather to adopt the underlying considerations, strategic principles, and development process that facilitated their creation.

Starting with sustainability

The defining feature of this approach is its reversal of conventional business model development. Rather than beginning with customer needs and subsequently incorporating sustainability considerations, the process starts with examining and defining sustainability challenges and desired societal outcomes and then explores how these can be translated into commercially viable opportunities.

Following this approach requires sustainability to be treated as the focal objective and starting point for business model development rather than as an additional criterion, with the subsequent task being to systematically identify pathways towards economic viability, operationalization, and scalability without undermining the sustainability goals that motivated the model in the first place. The experience of VTT and Modacc within CRAFT-IT4SD demonstrates that this is a significant task, with findings from within CRAFT-IT4SD showing that achieving economic viability while maintaining sustainability objectives is seen as the most significant barrier to the adoption of sustainability-oriented business models among practitioners (Figure 5) Yet, this is precisely where the value of the approach lies: it enables a more holistic perspective that exceeds immediate commercial interests and helps identify the mechanisms, dependencies, and frictions that emerge when business models are designed to address wider societal and environmental goals.

For organisations seeking to replicate this approach, the key lesson is to begin by identifying the sustainability challenge or societal outcome they aim to address and then iteratively develop business models that balance environmental, social, cultural, and economic objectives. While the specific solutions will vary across contexts, the sustainability-first mindset provides a transferable foundation for business model innovation.

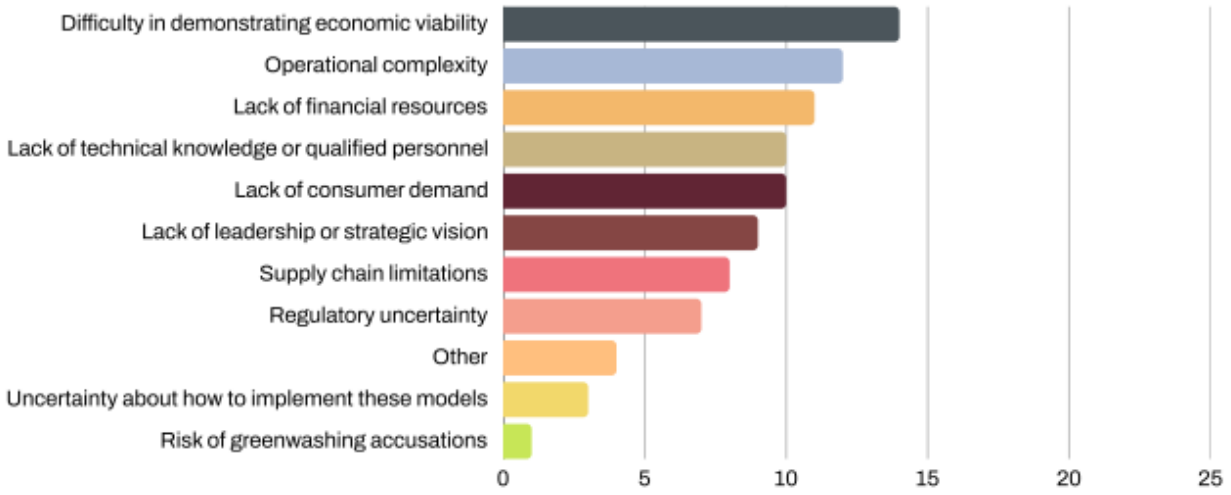

Figure 5: Barriers to Sustainable Business Model Adoption (Source: Modacc)

Analytical Grounding

Another key characteristic of this approach is its strong analytical foundation, drawing on data and evidence from multiple sources. Business model generation is not driven by intuition or isolated entrepreneurial ideas but is grounded in empirical research, stakeholder perspectives, and environmental assessments. The integration of analytical tools such as Life Cycle Assessment provides an important foundation for assessing sustainability based on measurable environmental impacts and enables a more critical evaluation of sustainability contributions and trade-offs. Building upon such a strong knowledge base increases both the credibility and legitimacy of the resulting concepts.

At the same time, building such an evidence base remains challenging. Although an increasing number of companies are reporting on their sustainability-oriented practices and business model elements (Fashion Revolution, 2024), systematic and comparable information is often fragmented and difficult to access. Existing knowledge and data are

dispersed, while language barriers, limited public disclosure, and the underrepresentation of micro and small enterprises further constrain access to relevant insights. As a result, identifying, accessing, and analysing data on business models and their impact often requires considerable effort, highlighting the need for more accessible and systematically curated knowledge resources.

It is also important to note that model concepts that emerge primarily from research and expert-led analysis rather than from entrepreneurs' ongoing experimentation in the marketplace risk remaining theoretically attractive while encountering unforeseen challenges when exposed to real-world market conditions and operational constraints. For this reason, attention should be paid to the next replication aspect.

Business models as tools for learning and dialogue

A major strength of the presented approach lies in its ability to make the elements and underlying logic of sufficiency-oriented business models explicit. By systematically linking sustainability mechanisms, value propositions, technologies, cultural resources, customer behaviour, and revenue models, the approach enables assumptions, trade-offs, potential adverse effects, and implementation challenges to be scrutinized against an established conceptual and empirical foundation before significant resources are committed.

Moreover, the resulting business models should not be viewed solely as blueprints for future ventures. Equally important is their role as tools for collaboration, exploration, and critical reflection. By making assumptions visible, stimulating dialogue, and revealing the conditions under which sustainability-oriented business models can succeed, they facilitate a deeper understanding of how sustainability can be integrated into business practice.

Replication efforts should therefore approach business model development not merely as a process of venture creation, but as a process of collective learning and exploration. Particular emphasis should be placed on making both business model elements and their interrelationships explicit, transparent, and assessable, thereby enabling systematic reflection on the mechanisms through which sustainability objectives are expected to be achieved and the conditions required for their realization.

Adopting a holistic understanding

Creating a robust knowledge base, developing business model concepts, and assessing both their internal viability and the external conditions required for their success was facilitated by following a structured and analytical process built around the continuous integration of insights from multiple perspectives and levels. Within CRAFT-IT4SD, the objective was to conceptualize sufficiency-oriented business models that combine sustainability objectives with elements of cultural heritage and digitalization. By nature, such an undertaking requires consideration of a wide range of environmental, social, cultural, technological, organizational, and economic factors.

To accommodate this breadth, the process adopted an open and inclusive approach that actively involved diverse stakeholders in the generation of knowledge, the development of business models, and their subsequent evaluation. In turn, the resulting business models served as boundary objects that facilitated dialogue, reflection, and collaboration among actors from different backgrounds by providing a common framework through which different perspectives, interests, and assumptions could be articulated and discussed.

Similarly, concepts were examined both within their local context and with regard to their transferability across regions. Replication efforts should therefore embrace a comparable breadth of stakeholder involvement and perspectives, recognizing that the quality and robustness of sustainability-oriented business models depends not only on their internal design but also on the diversity of viewpoints and contextual knowledge informing their development.

Lessons for Sustainability-driven Business Model Design

Beyond lessons for replicating the development process itself, CRAFT-IT4SD also provides insights for generating, refining, and adapting sustainability-oriented business models that integrate cultural heritage and digitalization.

Across the developed concepts, three recurring sustainability mechanisms emerged as particularly promising: extending product lifetimes through repair, upgrading, and customization; reducing overproduction by aligning production more closely with actual demand; and retaining products and materials in circulation through their identification,

organization, and recirculation. Rather than prescribing specific business models, these mechanisms should be understood as strategic directions that can be adapted to different contexts and opportunities.

Regarding sustainability, the findings suggest that the greatest potential lies in hybrid and integrated approaches that combine multiple mechanisms, supported by clear value propositions and targeted market positioning. At the same time, questions remain regarding the scalability and long-term commercial viability of sufficiency-oriented business models, highlighting the importance of supportive external conditions.

Digitalization can be an important enabler, supporting product lifetime extension, resource efficiency, coordination, customization, and new forms of value creation. However, its benefits should not be assumed, as digital solutions may also introduce rebound effects, environmental impacts, and additional complexity if they do not clearly strengthen the underlying value proposition.

Finally, cultural heritage and craft capabilities emerged as important sources of differentiation and value creation. Across the business models, they contribute through authenticity, trust, quality, creativity, and specialized knowledge, while also supporting broader goals related to cultural sustainability, including the preservation of heritage, skills, identity, and diversity. Together, these findings suggest that the greatest potential lies not in sustainability, digitalization, or cultural heritage individually, but in their strategic combination.

In summary, the presented approach constitutes a robust methodology for integrating multiple factors into sustainability-oriented business modelling by maintaining an analytical, bird's-eye perspective. However, an important limitation is its strong emphasis on ex-ante assessment and planning. While this is valuable for understanding sustainability impacts and evaluating alternative pathways, it may be less effective in highly uncertain environments where opportunities emerge through experimentation, interaction, and adaptation. For this reason, CRAFT-IT4SD complemented this top-down, causation-oriented approach with a second, more effectual approach based on bottom-up design principles and grounded in the experiences and activities of the pilot sites.

Relevant Resources

The following selected resources were developed or adapted within CRAFT-IT4SD to illustrate and support both causation-based approaches to developing business models for sufficiency and circularity (**Error! Reference source not found.**).

Resource	Type	Description
Mapping and descriptions of current business models in selected pilot sites	Report	The report maps and describes current business fashion business models and future business aspirations in the four CRAFT-IT4SD pilot sites in Denmark, Finland, Romania and Spain with a specific focus on sufficiency-based business models.
Climate impact assessment of current business models in the pilot sites	Report	The report presents the findings of the climate impact assessments (life-cycle-analysis) conducted for four micro and small-sized companies that operate in the CRAFTIT4SD pilot sites.
New business models that can support sustainable climate transition	Report	The report focuses on the development and assessment of new business models to support a sustainable climate transition in the fashion sector and beyond.
Catalonian Fashion Companies with Sustainable Business Models	Open-access document	To understand and showcase how companies can respond to regulatory developments, this document provides insights into the current state of adoption of sustainable business models in Catalonia. This document provides an overview of existing business models archetypes and gives visibility to companies that have successfully implemented them.

Future Development Aspirations and Alternatives in Sustainable Fashion	Article	The article introduces the concept, promises, and limitations of sufficiency-based business models.
The Market Environment of Sustainable Fashion Business Models	Article	The article provides a comprehensive analysis of the market environment for sustainable fashion business models based on empirical research.
Enabling Sufficiency-Based Consumption in Fashion	Article	The article explores how consumers can be brought on board with the sustainability transition and empowered to adopt more sustainable consumption practices.
Analysing the Climate Impacts of SME Fashion Business Models	Article	The article discusses climate impact insights and key considerations based on the analysis of several established sustainability-oriented business models in textile and fashion.
New business models and pathways for sustainable fashion in the digital era	Article	The article discusses the role of digital technologies in enhancing sustainability in the fashion and textile industry.
Digital Transformation as a Catalyst for Change for Micro-Companies and SMEs	Article	The article addresses the question of how smaller companies can turn digitalization into an opportunity for innovative change.

Table 1: Resources – New business models for circularity and sufficiency (causation-oriented pathway)

Pathway Two: From Resources to Opportunities

In parallel to the more causation-oriented pathway, which focuses on developing holistic business model concepts from a broad knowledge base to achieve desired sustainability outcomes, a second pathway has been followed within CRAFT-IT4SD that represents a more effectual approach to developing business opportunities, which starts with exploring how existing resources, capabilities, and stakeholder relationships can be (re-)combined to form the foundation for new sustainability-oriented value propositions.

Like the more causation-oriented pathway, this effectual approach also adopts a sustainability-first perspective. However, the key distinction lies in the direction from which development is approached. Instead of beginning with a comprehensive analysis and deriving holistic business model opportunities from a broad knowledge base, this pathway starts with bottom-up interventions to effectively generate new building blocks around which novel sustainability-oriented businesses can emerge. Multiple stages of value creation are thereby being addressed, from envisioning sustainable futures to experimenting with technologies, methods, and new materials and testing market potential. To illustrate its core logic, the following section draws primarily on activities undertaken at the VIA UC-pilot site (Region Central Denmark,) although elements of this approach can be observed across the CRAFT-IT4SD pilot sites.

Supporting Sustainability-Oriented Value Creation

Over the course of CRAFT-IT4SD, VIA UC refined its approach to more deliberately support micro-size companies and nascent practitioners in exploring how digital technologies and material-driven innovation could strengthen craft-based practices and enable more sustainable forms of production.

Early efforts focused on broader engagement and creating the foundation for more targeted action. This included creating a motivating vision of a desirable sustainable future by applying and adapting “The Thing From The Future tool” to the textile context. It encourages participants to discuss abstract, complex, or difficult sustainability challenges, remain in a divergent and exploratory mindset, and generate radical ideas for enhancing sustainability. This phase also included introductory workshops with micro-sized companies and nascent practitioners from both design and business backgrounds, introducing them to technologies such as AI and NFC tags and allowing them to explore their commercial potential through hands-on experimentation and testing with potential customers in the Neuro Lab without requiring significant upfront investments.

Building on these experiences, a key objective of the subsequent pilot activities was to increase the active engagement of suitable micro-size companies within the laboratory facilities. To achieve this, participation followed a targeted engagement strategy in which interested companies were identified and invited, resulting in the intensive involvement of five micro-size companies. Rather than prescribing a common development funnel, the pilot supported the individual development trajectories of each practitioner by introducing technologies and methods relevant to their existing resources, craft practices, and areas of interest. The guiding principle of this approach was to meet practitioners where they are: instead of offering a standardized programmes or workshops, support was tailored to participants' existing skills, projects, and ambitions while providing access to specialized facilities, expert knowledge, and research capabilities.

Working individually in the relevant laboratories, participants experimented with both analogue and digital technologies while developing new methods and prototypes. Support activities focused on equipping practitioners with technological tools and methodological frameworks that enabled them to reinterpret and extend their craft skills and cultural heritage knowledge. The collaboration itself was structured around “master–apprentice” relationships, pairing each company with internal VIA experts who acted as a dedicated sparring partner throughout the experimentation process. This one-to-one format provided continuous technical and methodological guidance and iterative reflection while simultaneously generating rich empirical material through observations and interviews documenting the process.

Frameworks such as Material Driven Design for Apparel and Textiles (MDD4AT) and the Sensorial Wheel were introduced to facilitate sustainability-oriented business development by providing systematic approaches for starting development from material qualities rather than predefined market assumptions. In doing so, they supported the exploration of material properties, sensory qualities, and design opportunities as the basis for new products, services, and business opportunities from (more) sustainable resources. Feedback and insights generated through practitioners' experimentation were continuously used to refine and adapt the frameworks, creating a reciprocal learning process in which practitioners and facilitators jointly contributed to their further development.

The pilot also sought to understand how materials are perceived and experienced by potential consumers and users. Prototypes were therefore evaluated in VIA UC´s Neurolab through a combination of eye-tracking studies and qualitative interviews, generating insights into sensory experiences and potential application areas. In line with the pilot's strong emphasis on experimentation, researchers from the Neuro Lab developed and tested a sensory box designed to capture tactile and multisensory responses, thereby extending material evaluation beyond predominantly visual assessment methods. These user research activities provide practitioners with evidence-based insights into how alternative materials are perceived and experienced, reducing uncertainty and informing decisions about their commercial applicability.

At the same time, the pilot incorporated principles of empathic design, encouraging participants to consider the perspectives and needs of various user groups throughout the development process. This broader understanding of user experience contributes to the development of more inclusive value propositions while strengthening product relevance and emotional attachment. In turn, such approaches have the potential to reduce the incidence of "wrong purchases" that often result in premature disposal and replacement.

To generate transferable knowledge for future practitioners and ecosystems, the pilot combined onsite observations with semi-structured interviews capturing participants' expectations, experiences during experimentation, and the integration of laboratory insights into their everyday practice. The resulting data illustrate how craft expertise, digital technologies, and material experimentation can support sustainability-oriented innovation while informing future approaches to technology adoption and the dissemination of craft knowledge.

Taken together, VIA UC´s effectual approach combined experimentation, individualized capacity building, and user-centred research. By enabling practitioners to build on their existing means, skills, and resources while introducing new technological and methodological possibilities, the pilot created an environment in which sustainability-oriented business opportunities could emerge organically through experimentation rather than through predetermined business planning.

Example Case: Developing casein-based materials for sustainable garments

The development of flexible casein-based materials illustrates the core logic of the effectual approach to sustainability-oriented business development. Rather than starting from a predefined product or market opportunity, the process began with an existing, underutilized resource – casein - and explored how it could become the basis for new forms of value creation. Drawing on cultural heritage recipes and combining them with material-driven design methods, researchers and practitioners engaged in an iterative process of experimentation, gradually replacing harmful substances such as formaldehyde with safer alternatives and testing different material properties, forms, and applications.

The case demonstrates how sustainability-first thinking, material-first design, and trial-and-error experimentation can generate novel opportunities rooted in existing resources and craft knowledge (Figure 6). At the same time, it highlights the importance of interdisciplinary collaboration, as expertise from material science, design, and craft practices was combined to develop new bio-based alternatives for the fashion and textile industry. While time-intensive, the process shows how experimentation and adaptation can transform surplus materials into promising foundations for future sustainability-oriented value propositions.

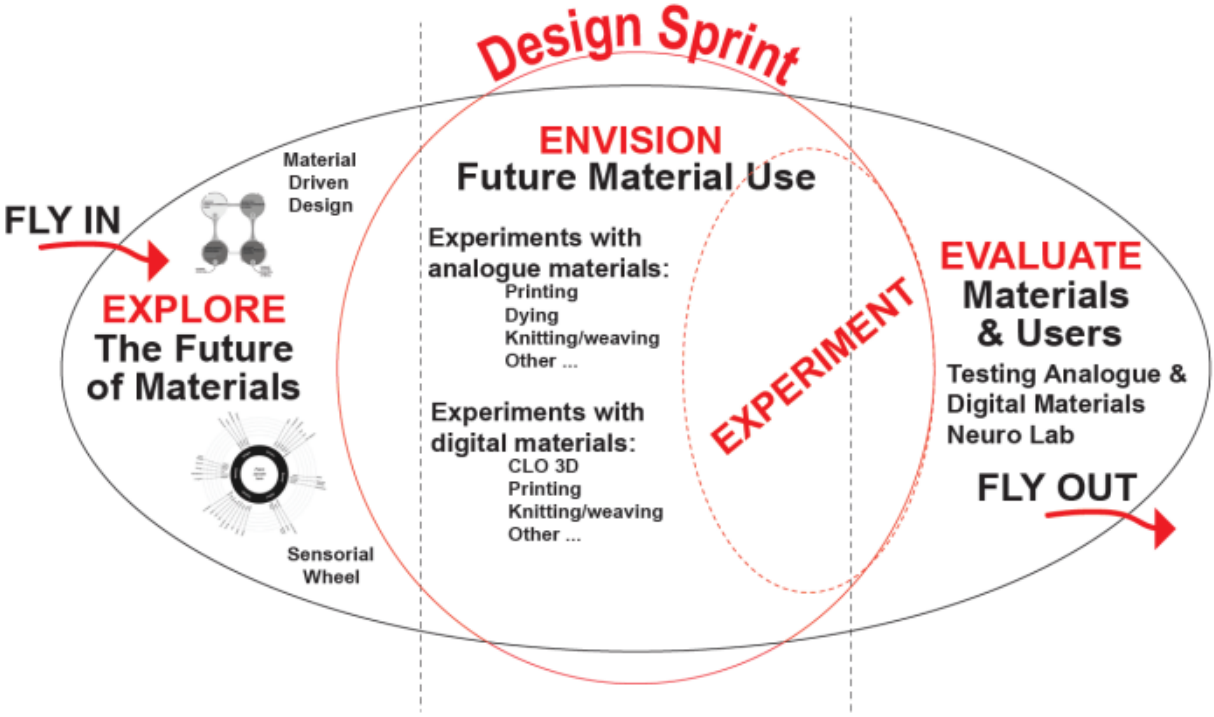

Figure 6: Material-driven design conceptualization (Source VIA UC)

Transferable Development Outcomes

Rather than formulating a top-down approach to generate holistic business model concepts, the more effectual pathway evolves around applying and producing transferable methods, capabilities, and experimentation practices for sustainability-oriented value creation under conditions of resource scarcity and uncertainty. It demonstrates how (micro-)companies can be more directly supported in leveraging their existing resources and capabilities to iteratively discover new business opportunities and transform production practices towards more circular and sufficiency-oriented forms of value creation.

As with the first pathway, a key replication-relevant outcome of this approach is the demonstration of a practical blueprint for supporting sustainability-driven entrepreneurship from the ground up, enabling ecosystems to foster business development through experimentation rather than predefined business planning. In the case of VIA, the companies partaking in this approach explored a diverse range of technologies and craft practices, including digital weaving technologies, textile printing and digital print techniques, and the combination of knit technologies with natural dyeing processes based on food waste. Complementing these practitioner-led activities, two internal expert

teams investigated emerging material opportunities through (1) the generation of textile print patterns using generative AI and (2) the development of drapable bio-materials based on casein and experimentation with existing recipes. As a result, novel forms of sustainability-oriented value creation that combine cultural and craft heritage with digital technologies have emerged (and continue to emerge) forming the foundation for new or transformed value propositions in business models.

Providing access to facilities and creating opportunities for effective experimentation and learning is particularly important for enabling smaller actors with limited resources to participate in technological developments. Such support allows them to identify new business opportunities, contribute to the sustainability transition, and avoid being left behind by technological and regulatory change. As highlighted in Deliverable D2.1 (Method Playbook), the fashion and textile sector is characterized by a multitude of SMEs that face significant limitations in effectively utilizing digital technologies. This fragmentation can hinder the sector's ability to exploit technological innovation and develop responsible growth through digitalisation.

At the same time, SMEs possess a unique capacity for agility, experimentation, and innovation, making them key drivers of the triple transition (D2.1). Unlocking this potential requires more than access to technology alone. It requires frameworks, methods, and collaborative environments that enable practitioners to connect their existing craft knowledge and practices with emerging digital technologies through a sustainability-by-design perspective. By gaining access to such support through facilitated effectual approaches, smaller actors can overcome the challenges of fragmentation and limited scale to help generate new, locally embedded value propositions that collectively contribute to a more sustainable and resilient ecosystems.

Since effectual processes are inherently individualized and context-specific, replication should not focus on reproducing exact steps or outcomes but rather on creating the conditions that enable similar processes to emerge. By fostering experimentation, collaboration, and practice-based learning, ecosystems can cultivate their own locally embedded pathways towards circularity and sufficiency instead of reproducing predefined business model concepts.

The following Table 2 illustrates selected tools, formats, and methodologies that were utilized, adapted, and developed by the VIA pilot site to facilitate bottom-up sustainability-oriented development. They exemplify ways for how new ways of thinking and working can be activated in a meaningful and practice-based manner. While conventional design processes primarily respond to user needs, these formats can help broaden the scope to also consider environmental limits and planetary wellbeing as integral parameters.

These examples are not intended as prescriptive methods or sequential steps but as illustrations of how effectual processes can be operationalized in practice. As adaptation, iteration, and experimentation are defining characteristics of the approach, the resources should be understood as inspiration and adaptable building blocks rather than definite solutions.

Tool	Application	Replication-relevant Insights
'The Thing from the Future' (Candy & Watson, 2015) Reflection on application for textile interactions. CRAFT-IT4SD adapted version: The **TEXTILE** Thing from the Future	**Future-oriented visioning and ideation** through gamification for motivation, idea development, and communication. Used in several workshops with a variety of participants.	**Gamify future thinking**: Gamification and cue cards are an effective way to stimulate (radical) imagination and fosters interdisciplinary dialogue. **Support exploratory thinking**: Foster an open mindset and provide additional facilitation for participants with limited ideation experience. **Contextualize the means**: Adapting the tool by replacing and adding domain-specific elements makes future visioning more accessible, relevant, and actionable.
Workshops on NFC tags	**Introducing the fundamentals of NFC technology and hands-on experimentation** with established and emerging professionals. Micro companies actively tested NFC application with potential customers	**Anchor technology in practical realities:** Integrating the participants' challenges and needs makes technologies relevant and helps identify application opportunities. **Increase the level of engagement:** Design resources and delivery to first establish foundational knowledge and interest, then gradually increase the complexity and focus towards concrete implementation opportunities.
Material Driven Design for Apparel & Textiles Framework (MDD4AT, based on MDD by Karana et al., 2025)	Facilitating design processes with a material first perspective. MDD4AT was tested with various participants representing both industry and education. The feedback has contributed to evaluating and adjusting the model to its current form.	**Challenge established design practices:** Adopting the material-driven design framework deliberately reverses traditional design processes, making facilitation and methodological support essential.
User experience research & The Sensorial Box	Measuring and testing users' sensory and tactile responses to materials to inform further development, using a custom-developed instrument that enables the measurement of tactile and emotional responses to textile materials without the influence of visual aesthetics.	**Innovate for insights:** Design testing methods that reflect the qualities being evaluated. For textiles and materials, integrating tactile and multisensory interactions provides richer and more relevant insights than visual assessment alone. **Integrate user testing early in material development:** Combining biometric measurements with qualitative interviews generates actionable insights that can inform iterative refinement of materials and concepts.

Table 2: Resources adopted and adapted as part of VIA UC´s effectual approach

Key Insights for Replication

The exploratory nature of this pathway means that it is not organized around a linear sequence of development steps and is rather guided by **a set of principles and insights** that enable new, sustainability-oriented opportunities to emerge through iterative exploration rather than predefined planning.

A defining principle is shared with the more causation-oriented approach: **the starting point is sustainability**. In the case of VIA, this meant for instance that, instead of identifying market- or user needs first and subsequently developing prototypes to address them, the process adopted a material-first perspective. Rather than treating materials as inputs selected after a product or business concept has been defined, materials (and methods) with environmentally preferable properties become the point of departure for exploration and development.

This principle was, for instance, operationalized through a **Material Driven Design** perspective, which places material properties, availability, and sustainability considerations at the centre of the design process. By acknowledging that future resource availability and environmental constraints will differ significantly from present conditions, the approach encourages participants to explore how materials themselves can inspire alternative products, practices, and business opportunities.

This logic strongly reflects the effectual "bird-in-hand" principle, which posits that new venture activities should begin with available means and an exploration of what opportunities they make possible. Translated into a sustainability-first context, this means that innovation starts from the sustainable resources, capabilities, and craft knowledge already at hand and asks what kinds of value creation become possible because of them. Instead of adapting materials to fit existing markets, business opportunities emerge through the creative exploration of sustainable materials and production practices, allowing environmental considerations to shape, rather than constrain, the development of new products, services, and business models.

A fundamental precondition for engaging sustainability-oriented development processes is a clear intention to change. To motivate the initiation and sustained engagement with this pathway, replication efforts should, therefore, **incorporate future-oriented thinking** that challenges existing assumptions while creating a shared and inspiring vision of sustainable futures. Such visioning activities generate energy, stimulate new ideas, and provide a constructive space for dialogue, enabling participants to move beyond current constraints and engage with more transformative possibilities. Tools such as Thing from the Future (Ref), as applied within CRAFT-IT4SD, provide a practical means of facilitating this process. Rather than attempting to predict the future, these speculative methods encourage participants to question established market and production logics, explore alternative scenarios, and collectively imagine new directions for sustainable value creation. By shifting the focus from existing constraints to future possibilities, they create a motivating and collaborative environment that supports experimentation and the emergence of more transformative opportunities.

A key characteristic of this pathway is practice-based experimentation, which treats opportunity development as an ongoing process of discovery rather than the implementation of predefined solutions. Instead of designing a complete business model upfront, practitioners iteratively test materials, technologies, methods, and user responses, allowing value propositions, production processes, and potential market applications to evolve through experimentation. This means that tools and methods are continuously adapted based on emerging insights, while participants are encouraged to engage in trial-and-error learning and respond to unexpected discoveries.

At VIA UC, this principle is operationalized through laboratory environments in which a selected group of micro-companies and nascent professionals work directly with materials, technologies, and experts to address challenges rooted in their own practices. Rather than maximizing the number of participants, the approach **prioritizes depth of engagement over breadth of outreach**, investing resources in practitioners who demonstrate the willingness to engage in intensive experimentation and collaborative learning to advance sustainability (see above). This creates the conditions for sustained reflection, iterative development, and the generation of richer insights than would be possible through broader but more superficial participation.

By engaging with sustainability and technological innovation through hands-on experimentation rather than abstract instruction, participants generate practical knowledge about what is technically feasible, environmentally meaningful, and commercially promising. The laboratory thus functions as a space for exploring potential value propositions, where new combinations of resources and capabilities can be tested and refined before being translated into products, services, or practices. The close collaboration between practitioners and experts further enables continuous feedback and adaptation, accelerating learning while producing transferable knowledge that can subsequently inform and inspire a wider ecosystem of actors.

Rather than validating predetermined business concepts, this process enables business opportunities to emerge incrementally through practice. New knowledge can immediately be integrated into existing routines and capabilities, allowing micro-enterprises to iteratively reshape how value is created, delivered, and captured while progressively moving towards more circular and sufficiency-oriented forms of business.

Together, these principles form a framework for how to facilitate and engage in sustainability-oriented business development that emphasizes discovery over prediction, experimentation over planning, and practical engagement over abstract modelling. As such, the approach complements more conceptual and strategy-oriented methods by generating insights into how sustainable business opportunities can emerge from materials, practices, and facilitating real-world experimentation.

Related Resources

The following selected resources were developed or adapted within CRAFT-IT4SD to illustrate and support effectuation-based approaches to developing business models for sufficiency and circularity (
Table 3).

Resource	Type	Description
Method Playbook (Initial)	Report	The report outlines the guiding principles and directions underpinning CRAFT-IT4SD, including approaches to experimentation, resource analysis, and design thinking that informed the pilots' effectual approach.
Operational Handbook for pilots and pilot ecosystems	Report	The report outlines the initial design and planned activities of the pilot projects, documenting the ideas and planned activities that informed the pilots' effectual development.
Initial Report of the Pilots	Report	The report provides insights into the first pilot iteration, detailing their activities, formats, participating stakeholders, and key takeaways.
Interim Report of the Pilots	Report	The report provides insights into the second pilot iteration, detailing their activities, formats, participating stakeholders, and key takeaways.
Final Report of the Pilots	Report	The report provides insights into the third pilot iteration while reflecting the cumulative experiences of all pilot iterations, detailing their activities, formats, participating stakeholders, and key lessons learned.
Additive Manufacturing and 3D printing for a sustainable crafted capsule collection	Article	The article outlines the effectual value creation approach by TUIASI in the form of developing a capsule collection combining tradition, sustainability, and technology.
From Tradition to Innovation by Integrating 3D printing and Sustainable Craft Development	Article	The article describes the intersection of heritage, sustainability, and innovation in the textile and fashion sector, illustrating how these dimensions can converge through the application of 3D printing technologies.
Traditional knowledge meets tomorrow's wardrobe for sustainability	Article	The article outlines the effectual value creation approach by OAMK in the form of exploring circular textile design using fish leather, recycled fishing nets, and printed electronics.
Combining Craft with Digital Technologies for Sustainability in Garment Design and Consumer Approaches	Article	The article outlines the effectual value creation approach and outcomes by VIA UC and their collaboration with micro-companies, combining hands-on experimentation with different materials, techniques, and technologies, consumer engagement, and heritage revitalization.
Cultural Heritage as a Pathway to Developing Future Materials for Garments. Trial-And-Error in Material Experimentations.	Article	The article describes effectual experime ntation processes conducted within CRAFT-IT4SD by VIA and OAMK, exploring cultural heritage as a foundation for contemporary material innovation. It presents two cases: the use of casein at the Danish pilot site (VIA University College) and the use of fish skin at the Finnish pilot site (Oulu University of Applied Sciences), illustrating how trial-and-error experimentation can transform traditional knowledge into new material applications.
Bright Ideas: Sustainable LED Tech for Fashion and Performance	Article	The article provides a detailed outline for effectually integrating LED technology in garment design and explores

		how sustainable LED solutions, combined with open-source tools and accessible design practices, can empower SMEs to innovate, express, and connect through light.
Brewing Creativity: Coffee's Role in Fashion and Textile Sustainability	Article	The article presents the effectual use of coffee packaging waste as an upcycled material in costume design.
Digital Carriers – Putting NFC into Action to Explore and Unlock Value Creation Potential	Article	The article describes the use of workshops to introduce students and businesses to NFC technologies and reflects on the lessons learned.
Traditional Mask-Insipired Sustianable Fashion Collection	Article	The article outlines the development process of a fashion collection combining aspects of cultural heritage, novel technologies, and sustainability.

Table 3: Resources - Business models for sufficiency and circularity

4. Green legislation as innovation catalyst

This pathway illustrates how regulatory requirements, particularly in terms of environmental legislation, can be translated into opportunities for innovation and value creation within the Cultural and Creative Industries.
Target Groups: Local and Regional CCSI-ecosystems; Business and Innovation Clusters; Local, Regional, and National Authorities and Policy Makers

Perspective

The relationship between regulation and innovation is multifaceted and complex. Depending on the nature of a legal framework, the characteristics of those affected, and a variety of contextual factors, regulation can either stimulate innovation and business development or act as a barrier. From a policy perspective, key considerations that influence its impact include the associated administrative burden, the level of stringency, the time allowed for compliance, and the flexibility with which objectives can be achieved (Pelkmans & Renda, 2014). In an evolution that reflects a broader recognition that regulation can do more than ensure compliance, EU regulatory policy has increasingly moved away from prescriptive rules towards more flexible and outcome-oriented frameworks that specify objectives while allowing businesses discretion in how to achieve them. This shift means that businesses and other actors have more agency in anticipating and strategically responding to emerging regulatory requirements.

Building on this outset, CRAFT-IT4SD promotes the perspective that regulatory change has the potential to become a **strategic opportunity for innovation and business development** rather than solely as a compliance challenge. By making emerging market- and sustainability requirements explicit, predictable, and universally binding, regulation reduces uncertainty and creates incentives for developing and integrating new business solutions. Regulatory requirements can, therefore, act as a catalyst for innovation by prompting actors to transform compliance into a source for value creation and competitive advantage (Heijnen at al., 2025), potentially triggering self-reinforcing dynamics in which initial innovation efforts lead to further experimentation, capability building, and market differentiation.

A key strategic objective of the EU is guiding the European economy towards greater resource efficiency and climate neutrality (European Commission, 2019). To achieve this objective, the EU has introduced a comprehensive framework of strategies, regulations, action plans, and directives aimed at reducing environmental impacts and accelerating the transition to a more circular economy. These policy instruments have significant implications for CCSI and, more specifically, for the textile industry selected as the focus of the CRAFT-IT4SD project, as it requires companies to adapt their products, operations, and business models to comply with evolving sustainability requirements (Morcillo et al., 2025). These policy instruments include, among others:

- The Circular Economy Action Plan (CEAP), which provides the framework for the EU's transition to a circular economy by promoting waste prevention, product circularity, and the separate collection, reuse, and recycling of textile waste.
- The EU Strategy for Sustainable and Circular Textiles, which aims to ensure that, by 2030, textile products placed on the EU market are durable, repairable, reusable, recyclable, and largely free of hazardous substances.
- The Ecodesign for Sustainable Products Regulation (ESPR), which establishes a framework for product-specific eco-design requirements, including potential requirements for durability, repairability, recyclability, recycled content, and Digital Product Passports for textiles.
- The Corporate Sustainability Due Diligence Directive (CSDDD), together with the Corporate Sustainability Reporting Directive (CSRD) and the European Sustainability Reporting Standards (ESRS), which strengthen corporate due diligence and harmonize sustainability reporting requirements.
- The Waste Framework Directive, which requires Member States to establish separate textile waste collection systems from 1 January 2025 to support reuse and recycling.

Complementing the EU's sustainability agenda, its competitiveness framework seeks to balance environmental requirements with measures that foster innovation, digitalization, and investment (European Commission, 2025a). Instead of viewing sustainability as a constraint, it aims to position sustainability requirements as a source of competitiveness and resilience. This policy orientation creates opportunities for new market actors that develop products and services enabling companies to meet emerging sustainability requirements, such as the Danish startup MiCollect, which helps businesses transform Digital Product Passport data into insights for business development and innovation. At the same time, the EU's principle of a just transition emphasizes that these opportunities should be accessible to all actors by ensuring that the costs and benefits of the green transition are distributed fairly and that affected actors receive adequate support. Accordingly, transformative policies should account for differences in capabilities and resources, particularly among smaller actors, enabling them to comply effectively rather than being disproportionately disadvantaged. This, in turn, highlights the importance of feedback loops to understand the needs and challenges of regulated actors in order to inform inclusive policy design.

However, while policy can create the conditions for an effective and inclusive transition, realizing the innovation potential of regulation ultimately depends on how companies and practitioners act upon it. Regulatory frameworks and requirements are often complex, evolving, and dispersed across multiple policy instruments, making them difficult to interpret and translate into concrete business actions, particularly for resource-constrained actors. To move beyond compliance, firms must be able to identify the implications of regulatory change for their products and practices and recognize where new opportunities may emerge. This, in turn, calls for accompanying support mechanisms in the form of guidance, resources, and collaborative formats that lower response barriers and strengthen actors' capacity to identify innovation potentials and develop their business alongside evolving sustainability requirements.

CRAFT-IT4SD addresses this challenge by strengthening the capacities required to navigate and leverage sustainability regulation. Through engagement with relevant actors and the targeted development of resources and collaborative learning formats, the project´s initiatives help to lower adoption barriers and enable CCSI actors to transform regulatory requirements into opportunities for innovation, business development, and long-term competitiveness.

Approach

Based on the described perspective, the CRAFT-IT4SDs approach to supporting CCSI in transforming regulation into opportunity, spearheaded by Modacc in Catalonia, was structured around three strategic pillars (Figure 7).

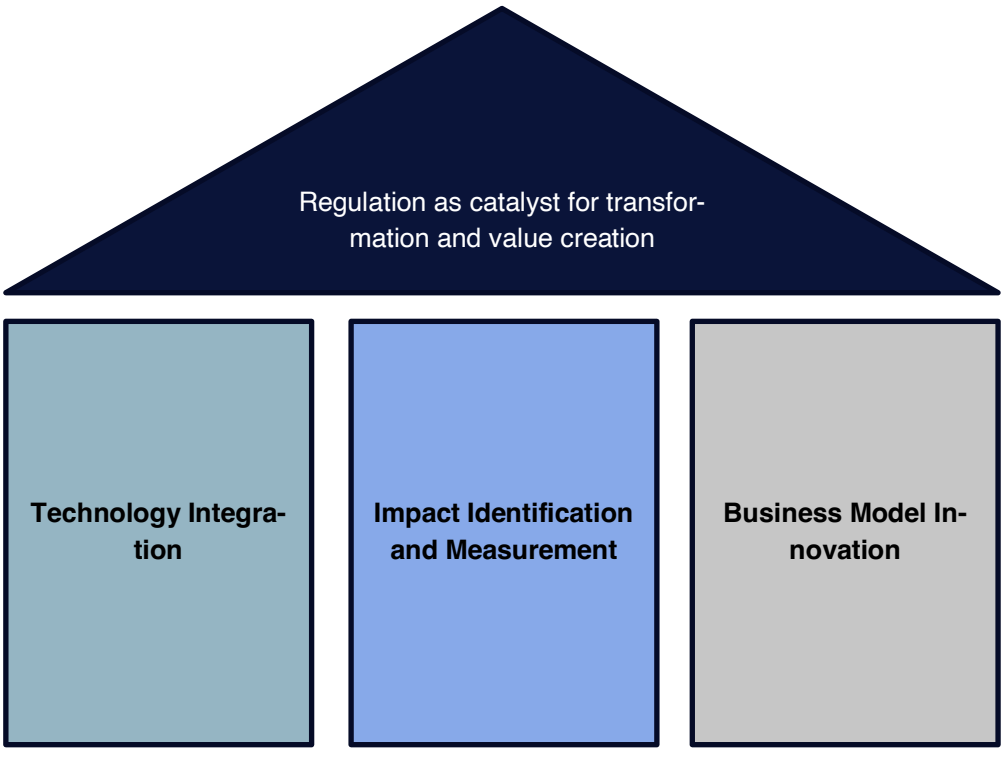

Figure 7: Pathways for leveraging regulation to strategic opportunity

The first pillar centers on **technology integration** and seeks to encourage experimentation and digital adoption as pathways to both compliance and competitive advantage. Beyond helping companies meet regulatory requirements, it aims to strengthen awareness, capabilities, and strategic thinking around how technology can unlock new opportunities for innovation and value creation.

The second pillar focuses on **impact measurement**, supporting companies in understanding, assessing, and responding to emerging sustainability requirements through practical impact measurement approaches that not only facilitate compliance but also generate insights for innovation and value creation.

The third pillar focuses on **connecting regulation and business model innovation** by showcasing how companies successfully leverage current and emerging legal requirements into a source of competitive advantage.

The following sections describe how each pillar was implemented in practice, the rationale and principles underpinning the chosen approach, and the key lessons learned and enabling factors for replicating approaches that help businesses transform regulatory requirements into strategic opportunities.

Leveraging Regulation through Technology

Technological solutions are an important enabler for meeting and leveraging regulations. Technologies support data collection, traceability, monitoring, and reporting while simultaneously generating insights that help companies create value. In this sense, technology can not only facilitate and accelerate compliance but also unlock opportunities for innovation and value creation. However, recognizing and translating this potential into practice requires strategic action and targeted support. Companies must be able to identify relevant technologies, understand their applicability to emerging regulatory requirements, and assess how they can contribute to broader business objectives.

CRAFT-IT4SD's approach to strengthening the link between regulation and technology was based on the recognition that many companies face regulatory and technological uncertainty, capability gaps, and a lack of structured opportunities to connect sustainability challenges with technological solutions. Preliminary findings from the ongoing CRAFT-IT4SD industry survey support this latter observation[2], with more than 40% of respondents finding it difficult or very difficult to access relevant digital technologies (Figure 8).

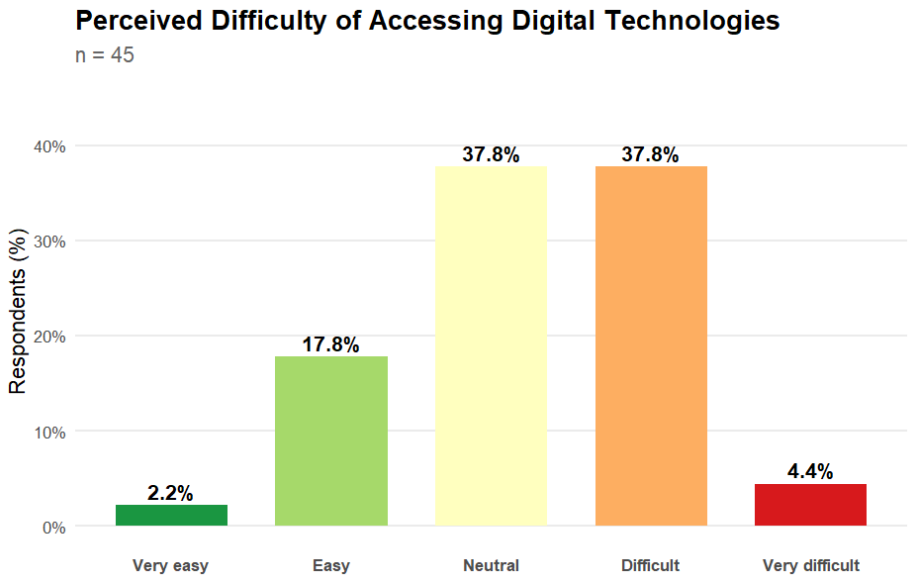

Figure 8: Reported Difficulty of Accessing Digital Technologies Among Fashion and Textile Businesses

[2] Preliminary findings from the ongoing CRAFT-IT4SD survey conducted among companies across the fashion and textile value chain in the project's four pilot regions.

Moreover, although both regulation and technology are recognized as important drivers of sustainability by parts of the sector (identified as such by approximately 33% and 22% of respondents, respectively), respondents who identified regulation as a key driver were no more likely to identify technology as a key driver than those who did not. This suggests that the connection between regulatory requirements and technological solutions is not self-evident for many companies and requires targeted support, awareness-raising, and brokerage activities to be effectively established.

To bridge these gaps and foster proactive strategizing and experimentation, Modacc spearheaded a set of initiatives designed to help companies see and approach regulation and technology as interconnected drivers of sustainable value creation and innovation. These initiatives were structured around two complementary levers: **Strategic Capacity Building** and **Technology-Industry Brokerage** (Figure 9).

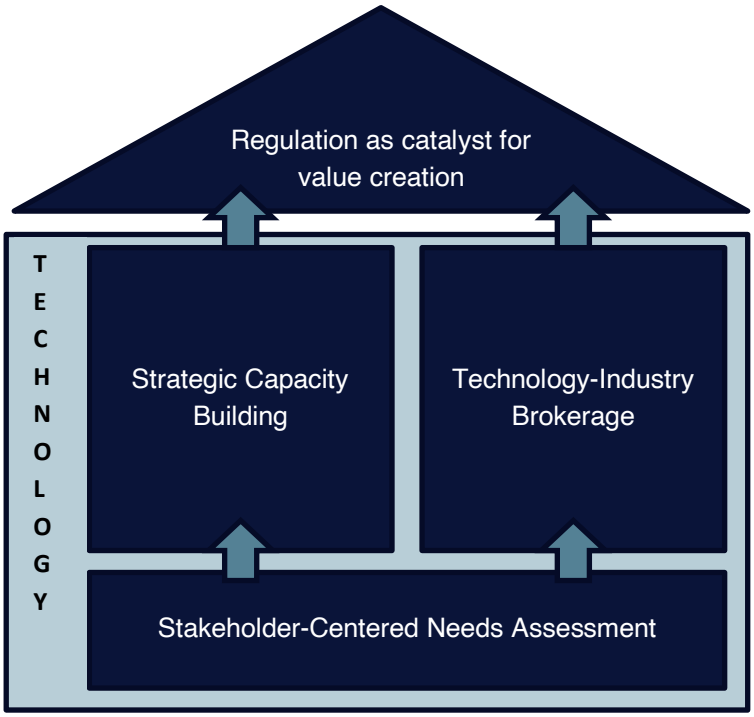

Figure 9: Framework for leveraging regulation through technology integration

The foundation for these initiatives formed a **stakeholder-centered needs assessment** designed to understand the needs, concerns, and priorities of different industry actors in connection with responding to emerging regulation and technology adoption. Based on the principle that **effective transformation processes must be grounded in an understanding of the practical realities**, Modacc organized focus groups with business leaders and representatives from the domestic fashion and textile industry to ensure that subsequent activities remained context-sensitive and relevant to the target actors within their local ecosystem.

Drawing on the insights gathered, Modacc designed and conducted a series of workshops to help build the capabilities needed to navigate sustainability regulation and technology integration (Figure 10). The topics addressed ranged from sustainability strategy development, artificial intelligence, sustainability reporting, traceability, strategic sustainability communication, eco-design, life cycle assessment, to modular design. The workshops aimed at supporting companies in translating regulatory requirements into actionable business considerations, while also increasing awareness of technological possibilities that help not only with compliance, but can also enable operational improvement and new forms of value creation.

Complementing these efforts, other CRAFT-IT4SD partners also contributed targeted capacity-building activities. For example, VIA University College organized workshops on the application of Near Field Communication (NFC)

technologies, demonstrating how digital product information can support emerging regulatory requirements, such as the Digital Product Passport, while creating new opportunities for customer interaction and product transparency.

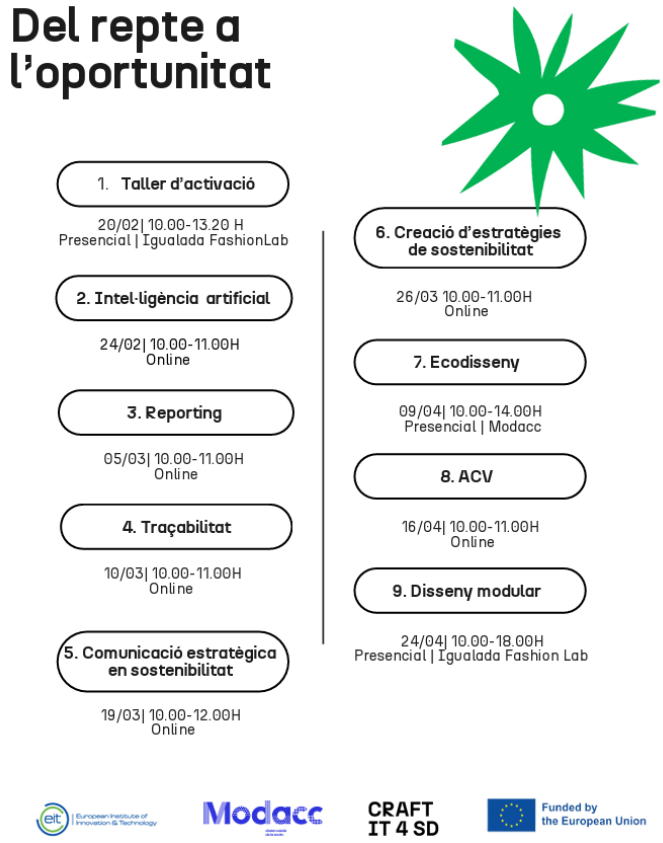

Figure 10: Modacc Workshops on intergrating Sustainability and Innovation

In parallel, Modacc conducted a regional scouting process to identify relevant technologies and technology providers capable of supporting sustainability-related compliance and transformation processes. Based on the recognition that technology adoption is not solely constrained by a lack of awareness and capacity, but also by **limited cross-sector exchange and visibility of available solutions,** the identified technology providers were subsequently brought together with fashion and textile companies through a dedicated technology fair. This **brokerage approach** was chosen to connect industry actors with technology providers and enable partnership opportunities that may otherwise not emerge. The event facilitated direct exchange, live demonstrations, and practical exploration of technological applications in real-world contexts, which can help reduce knowledge barriers, foster curiosity and trust between actors, and stimulate collaboration across sectors.

Reflections from the Industry

Feedback from participating company Munich Sports highlighted the value of Modacc's approach to leveraging regulation:

"As a company with a long tradition of manufacturing footwear in Catalonia, the workshops and technology fair helped us see that sustainability is not only a regulatory requirement but also an opportunity to innovate and strengthen our competitiveness. We discovered technologies and practical solutions that encouraged us to rethink our processes, materials, and approach to future challenges.

Initiatives like this provide valuable opportunities to step away from day-to-day operations, learn from other companies, and connect with technology providers and innovation experts. This helps us identify improvement opportunities, reduce uncertainty, and make more informed decisions when adopting new technologies and sustainable practices.

The combination of practical workshops, case studies, and networking opportunities helped us understand how sustainability requirements can be translated into feasible business actions, making innovation a driver of long-term value rather than simply a compliance exercise."

– Munich Sports, Catalan footwear manufacturer (established 1939)

Overall, the chosen approach to supporting technology integration combines **bottom-up stakeholder engagement, strategic dialogue and capacity building, and ecosystem brokerage** as key drivers for fostering a proactive approach to accelerate both regulatory readiness and new value creation.

The Future or Impact Measurement

Identifying, measuring, and effectively using the impact indicators required for sustainability compliance remains a significant challenge for many companies. Regulatory requirements and reporting standards continue to evolve, and the methodologies, metrics, and data systems needed to support them are still being developed and refined across industries.

Nevertheless, impact measurement is set to be a cornerstone of sustainability regulation, underpinning both compliance and performance monitoring. Early adoption and experimentation with impact measurement frameworks, indicators, and supporting technologies can therefore provide companies with a strategic advantage. While often viewed primarily as a compliance requirement, impact measurement can also serve as a strategic management tool, providing the data needed to strengthen regulatory adaptability, support evidence-based decision-making, and reveal opportunities for innovation and value creation.

Given its strategic potential, it is important for companies to understand which impact measurement tools are available and whether they are suitable for their specific operations and objectives. To support this process, Modacc spearheaded efforts within CRAFT-IT4SD to identify and test relevant impact measurement solutions and develop practical guidance to support their adoption in response to current and emerging sustainability requirements.

However, while the initial approach focused on testing tools and facilitating their application, the process had to be adapted in response to the realities observed among participating companies. It became evident that many SMEs lacked a foundational understanding of what impact measurement entails, the relevance of different tools, and how impact data can help be used to support compliance, decision-making, and innovation. This challenge is particularly pronounced among smaller firms, which frequently face resource- and knowledge constraints and lower absorptive capacity for complex regulatory and technical information.

Following the principles that **effective transformation processes must be grounded in the practical realities, capability levels, and strategic priorities**, and that **understanding must precede implementation**, Modacc subsequently broadened the scope of its intervention. Instead of focusing solely on tool testing and deployment, greater emphasis was placed on building foundational knowledge and awareness around impact measurement and its role in sustainability, business development, and regulatory preparedness.

As with the technology integration pillar, the approach to fostering impact measurement was therefore grounded in the initial assessment of existing capabilities, barriers, and expectations within the sector. In parallel, a mapping and prioritization of relevant regulatory and normative frameworks was conducted. Twelve frameworks were considered most relevant to the fashion and textile industry based on their **urgency, complexity, and expected impact magnitude,** with three of them (Ecodesign for Sustainable Products Regulation, European Climate Law, and Directive on Substantiation of Green Claims and Empowering Consumers) being selected as focal frameworks to equip companies with both the knowledge and the practical resources needed to navigate evolving sustainability requirements and leverage impact measurement as a strategic tool for adaptation and value creation.

As a result, the chosen approach followed an hourglass-shaped process (Figure 11). It began with a broad exploration of stakeholder needs and emerging normative frameworks, which was subsequently narrowed through internal mapping, assessment, and prioritization activities. From this point onwards, the funnel gradually widened again. Initial workshops were conducted with business representatives from local ecosystems to build foundational knowledge on impact measurement and support participants in understanding, assessing, and applying relevant frameworks.

Following the principle that many companies - particularly SMEs - have limited resources, time, and absorptive capacity, regulatory requirements were deliberately translated into simple, practical, and actionable guidance. Rather than presenting regulations in abstract or purely legal terms, workshop participants were provided with simplified roadmaps and step-by-step action plans outlining concrete measures they could take within their own organizations. To further strengthen learning and application, these activities were complemented by interactive and gamified exercises that encouraged participants to apply newly acquired knowledge to realistic business scenarios and product development challenges. This helped bridge the gap between understanding regulatory requirements and implementing them in practice. As the culmination of the process, the insights generated through these interactions were then used to develop a practical guide and roadmap addressing the three selected frameworks, which was subsequently made available as an open-access resource ("Unboxing Sustainable Fashion") for wider dissemination across European ecosystems.

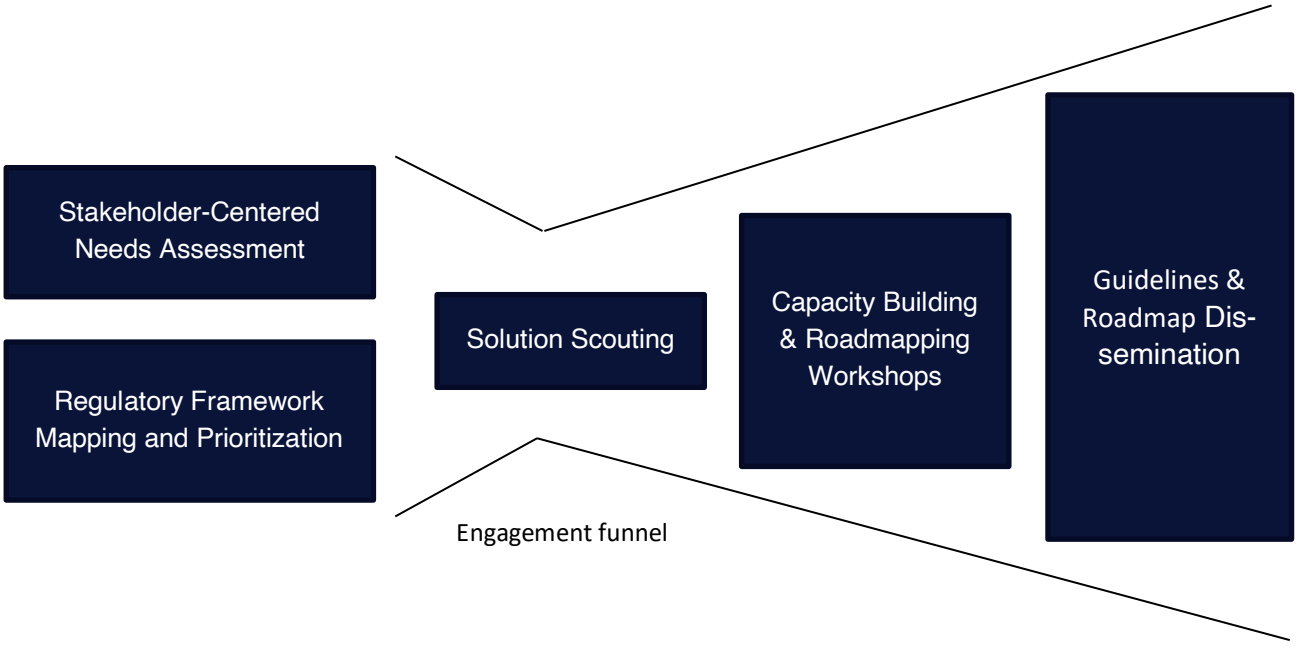

Figure 11: Framework developing capacities and guidelines around for impact measurement

This approach proved highly effective. By initially focusing on a limited number of frameworks and working closely with local stakeholders, facilitators were able to translate often complex regulatory requirements into clear, practical, and actionable guidance that could be adopted even with limited resources and expertise. At the same time, the localized and interactive nature of the workshops enabled the continuous collection of feedback, allowing materials to be refined based on real-world challenges, questions, and implementation needs. Thus, the chosen approach reflects the idea that solutions intended for broad adoption are often most effective when developed through close engagement with end users and iteratively refined before being scaled. By combining focused experimentation, stakeholder co-creation, and open dissemination, the initiative was able to generate resources that were both locally grounded and broadly applicable.

Building on Regulation: From Compliance to Business Model

Addressing regulatory requirements through technology and impact measurement constitutes important building blocks for companies. However, fully leveraging sustainability regulation and succeeding in an evolving regulatory environment requires integrating sustainability into coherent business models that manage to create economic value while aligning with the objectives of the European sustainability agenda, particularly the transition towards a circular economy and the broader goal of decoupling economic growth from resource consumption (European Commision, 2020).

While approaches to developing sustainability-oriented business models and business model elements are discussed in detail in Chapter 3 “Business Models for Sufficiency and Circularity”, this strand places greater emphasis on creating a typology of existing business models, their application in practice within the Catalonian Ecosystem, and the showcasing of successful cases that can inspire and accelerate broader uptake across the sector. (Table 4) outlines the key steps comprising the approach to this development pillar.

Step	Contribution to Main Objective	Results Obtained
1	Academic research on sustainable business models	Identification of predominant SBM typologies applicable to textile and fashion industry
2	Mapping of sustainable business models in Catalonia	Identification of experts and knowledgeable professionals
3	Survey creation	Development of stakeholder consultation methodology and tool
4	Stakeholder insights collection	Collection of ecosystem perceptions and implementation challenges
5	Mapping of brands implementing SBMs	Validation and consolidation of practical examples
6	Creation of the living document	Development of open-access educational and dissemination material
7	Dissemination	Publication and ecosystem-wide communication of results

Table 4: Steps to building a knowledge resource and directory for sustainability-oriented business models

The process began with academic and sectoral desk research on sustainability-oriented business models relevant to the textile and fashion industry. This stage established the conceptual foundation for the pilot by identifying predominant business model typologies related to circularity, resource efficiency, waste reduction, transparency, social impact, and extended product lifecycles. It also provided insights into common implementation barriers, enabling factors, and innovation opportunities among SMEs, informing the subsequent ecosystem mapping and stakeholder survey.

Building on this foundation, the MODACC pilot team conducted a mapping exercise to identify organisations within the Catalonian fashion and textile ecosystem that had already adopted sustainability-oriented business models or operational practices. The objective was not only to capture the diversity and maturity of sustainability initiatives within the region but also to identify concrete examples capable of inspiring and accelerating adoption by other

actors. The mapping included fashion brands, consultancies, technology providers, innovation centres, sectoral organisations, and waste management actors, creating a comprehensive overview of the regional sustainability ecosystem.

To complement the mapping activities, a stakeholder survey was designed and distributed to gather empirical insights into ecosystem maturity, implementation barriers, integration gaps, and sustainability priorities. The engagement strategy sought to capture perspectives from a representative range of ecosystem actors while generating transferable knowledge for the wider European textile and fashion sector. Many respondents had previously participated in the first pilot iteration, ensuring a high response rate.

The results of the desk research, ecosystem mapping, and stakeholder survey were consolidated into an open-access living document (Catalan Fashion Companies with Sustainable Business Models) designed to showcase successful sustainability-oriented business model implementation within the Catalonian textile and fashion ecosystem. The final document was disseminated through MODACC communication channels, including its website and LinkedIn platform, contributing to ecosystem visibility, collaborative learning, and the wider CRAFT-IT4SD objective of supporting sustainability transition through the sharing of practical knowledge and successful examples.

Transferable Development Outcomes

CRAFT-IT4SD's perspective of viewing sustainability regulation as an opportunity, combined with its multifaceted approach to fostering this perspective in practice, resulted in several outcomes that highlight its replication value. Drawing on Modacc's implementation experience as an illustrative case, the following section synthesizes these outcomes to illustrate how replication by other facilitators can strengthen regulatory readiness and value creation in other ecosystems.

A. Increased ability to connect regulation and technology

Combining capacity-building activities and cross-industry networking enables companies to view technology not merely as an operational tool, but as a strategic means of responding to regulatory change and generating value beyond compliance. In doing so, these initiatives address a key challenge identified at the outset: the lack of a clear and intuitive connection between regulatory requirements and technological solutions.

A core prerequisite for leveraging regulation through technology is the ability to identify, understand, and evaluate technological opportunities in light of emerging sustainability requirements and broader business objectives. Such capabilities can be effectively developed through targeted capacity-building activities that translate complex regulatory and technological developments into practical business considerations. In the case of CRAFT-IT4SD, tailored workshops played a key role in strengthening companies' ability to make informed decisions regarding technology adoption and integration, enabling them to assess not only compliance benefits but also opportunities for innovation and value creation.

The technology scouting and brokerage further facilitate new connections between industry actors and technology providers, improving awareness of available options and strengthening the regional innovation ecosystem. These interactions subsequently foster exploratory collaborations, pilot projects, and continued dialogue between participants, moving companies from awareness and understanding towards experimentation and implementation. Such early-stage experimentation represents an important precursor to longer-term innovation, adoption, and organizational transformation.

B. Enhanced capability to operationalize regulatory requirements

Understanding and operationalizing emerging sustainability regulations remains a significant challenge for many companies, yet it is an important prerequisite for turning regulatory requirements into opportunities for innovation and value creation. Narrowing the focus to a limited number of strategically relevant frameworks and providing tailored guidance helps strengthen organizations' understanding of sustainability regulations, impact measurement concepts, and the relationship between measurement, compliance, and business strategy.

Simplified guidance, practical roadmaps, and hands-on exercises make complex regulatory concepts accessible and relevant to day-to-day business operations and position impact measurement not merely as a compliance and reporting obligation, but as a strategic capability that supports decision-making, innovation, and organizational development. Tailoring content to the realities, resources, and capability levels of participating organizations is particularly important for reducing the knowledge and capacity barriers that often prevent smaller firms from engaging proactively with sustainability regulation.

Close interaction with stakeholders creates valuable feedback loops that support the iterative refinement of guidance materials and ensure their practical relevance. This enables local learning and implementation experiences to be transformed into transferable guides and roadmaps that can be adapted across different contexts. As such, the funnel-shaped process of needs assessment, prioritization, capacity building, co-creation, and open dissemination provides a replicable model for helping organizations respond effectively to evolving sustainability requirements.

Overall, the approaches demonstrated how targeted capacity-building, ecosystem facilitation, and practical translation mechanisms can transform sustainability regulation from a compliance challenge into a platform for experimentation, innovation, collaboration, and value creation.

C. Illuminating the path to sustainability in business

To accelerate the sustainability transition, it is essential to demonstrate that sustainability-oriented business models are not merely compliance responses but viable sources of innovation and competitive advantage. Showcasing successful examples provides organisations with a platform, reduces uncertainty for others, and inspires broader adoption, gradually influencing customer awareness, market expectations, and industry practices.

A key replication-relevant outcome is the demonstration of how ecosystem-wide visibility can accelerate the adoption of sustainability-oriented business models. By systematically identifying, mapping, and showcasing successful implementation cases, ecosystems can reduce uncertainty, make abstract sustainability concepts tangible, and provide SMEs with relatable examples operating under similar conditions. Rather than prescribing a single business model, the approach creates a continuously evolving knowledge base that inspires experimentation, highlights diverse pathways towards sustainability, and gives pioneering organisations a platform to influence peers and shape broader market expectations.

CRAFT-IT4SD's Modacc addresses this through an open-access living document that combines desk research, ecosystem mapping, and stakeholder perspectives into a practical directory of Catalonian organisations implementing sustainability-oriented business models. The document highlights diverse implementation approaches and showcases real-world examples that SMEs can learn from and adapt to their own context. Complemented by business model typologies, ecosystem insights, implementation trends, and stakeholder reflections, the living document serves as an evolving knowledge resource that promotes collaborative learning, increases the visibility of pioneering organisations, and accelerates the uptake of sustainability-oriented business models across the textile and fashion ecosystem.

D. Deriving Policy Recommendations

As discussed in the *Perspective* section of this development strand, the sustainability transition is shaped not only by how companies interpret and respond to regulatory frameworks but also by how those frameworks are designed and implemented. Accordingly, CRAFT-IT4SD has generated insights that contribute to a better understanding of the practical implications of existing legal frameworks, providing valuable feedback on implementation challenges and opportunities to strengthen their capacity to foster innovation across diverse actors (Heijnen et al., 2025).

This work began with a mapping and analysis of relevant policy documents, followed by engagement with sister projects and key initiatives to ensure alignment and identify complementarities. As the project progresses, these perspectives and recommendations continue to evolve. Several priorities have emerged: improving access to high-quality sustainability data and common data standards, particularly for small and micro-enterprises; increasing the visibility and representation of micro-companies, whose fragmentation often limits their influence in policy processes;

promoting the uptake of bio-based and other low-impact materials to address microplastics and broader environmental pollution; and prioritizing and incentivizing sufficiency-oriented business models that reduce resource consumption while creating sustainable value.

Although not a direct outcome of CRAFT-IT4SD's efforts to help companies translate regulation into business opportunities, the resulting interactions have created valuable feedback loops that enable facilitators to capture and reflect on companies' experiences with existing regulatory frameworks. These insights can, in turn, be communicated upstream to policymakers, informing recommendations that support not only more effective adoption but also the ongoing refinement and improvement of the underlying frameworks

Key Insights for Replication

The central takeaway is that regulation becomes an opportunity not through legislation itself, but through the capabilities that organizations develop in response to it. Companies can adopt either a reactive or a proactive approach to regulatory change (Morcillo et al., 2025). A reactive approach focuses on meeting legal obligations while minimizing disruption and compliance costs. In contrast, a proactive approach anticipates regulatory developments and treats sustainability frameworks as strategic guidance for innovation and business development. In the former case, regulation is primarily experienced as a constraint and cost factor; in the latter, it becomes a catalyst for innovation and long-term business value.

In practice, however, this distinction is rarely clear-cut. Moving beyond compliance is not an immediate shift in mindset but a gradual process that begins with developing an understanding of regulatory frameworks and their implications, followed by building the capabilities needed to interpret, strategically respond to, and ultimately leverage them for innovation and business development. Through a multifaceted approach that integrates technology, impact measurement, and business modelling, CRAFT-IT4SD supports companies in progressing from understanding sustainability frameworks to integrating them into their operations and leveraging them for business development.

Successful replication in other contexts depends less on the specific regulatory frameworks selected and more on creating the right conditions and mechanisms that help organizations understand regulatory change, identify its strategic relevance, experiment with possible responses, and convert compliance requirements into new forms of value. The following transferable key considerations derived from CRAFT-IT4SD's approach help guide successful replication by other facilitators:

- **Start from Real Organizational Needs** – Interventions are most effective when they are grounded in the actual needs, priorities, capabilities, and challenges faced by adopters rather than assumed needs.
- **Build Regulatory Literacy Before Introducing Solutions** – Companies cannot leverage regulatory opportunities if they lack a basic understanding of the underlying concepts, objectives, and implications of new requirements.
- **Treat Compliance as a Source of Strategic Intelligence** – Compliance-related activities and data should be presented not merely as reporting obligations but as valuable sources of insight for decision-making, innovation, and business development.
- **Make the Regulation–Technology Connection Explicit** – Firms do not necessarily associate regulatory requirements with technological solutions and that connections between regulatory challenges and technological opportunities must be actively established.
- **Reduce Complexity and Prioritizing Strategic Relevance** – Mapping and prioritizing frameworks according to their urgency, complexity, and expected impact helps simplify their content and concentrate efforts on areas with the highest potential for both compliance and value creation.
- **Use Local Learning to Create Scalable Knowledge** – Insights generated through local experimentation and stakeholder engagement can be transformed into transferable resources that support adoption and adaptation across broader ecosystems.
- **Innovation Ecosystems Require Active Brokerage, Not Passive Networking** – Meaningful collaboration and innovation are more likely to emerge when dedicated actors actively connect stakeholders, facilitate interactions, and create opportunities for joint experimentation and learning

- **Make Success Visible** – Showcasing viable models for leveraging green legislation in practice and providing a platform for success cases constitutes valuable means to inspire adoption and provide fuel for an ongoing sustainability transition.

Related Resources

The following selected resources have been developed within CRAFT-IT4SD to facilitate companies' adoption of sustainability legislation and support the translation of regulatory requirements into innovation and business development opportunities (
Table 5).

Resource	Type	Description
Catalonian Fashion Companies with Sustainable Business Models	Open-access document	To understand and showcase how companies can respond to regulatory developments, this document provides insights into the current state of adoption of sustainable business models in Catalonia. This document provides an overview of existing business models archetypes and gives visibility to companies that have successfully implemented them.
Unboxing Sustainable Fashion	Open-access document	A detailed guide published by Modacc based on their work in supporting micro-companies in responding and leveraging regulation. The guide focused on three key EU regulations: Ecodesign, Decarbonization, and Green Claims. It explains their content and implications in detail and provides step-by-step instructions for how companies can address them. The guide also offers an overview of relevant tools to conduct impact and performance measurement and guidelines for how to use them.
Guiding the Adaption of Micro-Companies and SMEs to the new Legal, Sustainable, and Digital Framework in the Textile and Fashion Sector	Article	The article describes Modacc's process for turning legislation into a strategic opportunity and enhancing ecosystem readiness.
From Compliance to Integration: Value Creation through Legislation Adoption	Article	This article explores what moving from compliance to integration really means, and why it can become one of the most transformative investments for companies navigating the EU's sustainability landscape.
Fashion Industry under the Legislative Loop	Article	This article discusses how evolving EU sustainability regulations are reshaping the fashion industry.
On the Spotlight: The Role of Certification and Labelling in Sustainable Fashion	Article	This article explains the why and how of certification and labelling in the fashion industry.
Digital Transformation as a Catalyst of Change for Micro Companies and SMEs	Article	This article addresses the question of how smaller companies can turn digitalization into an opportunity for innovative change.
Optimizing your Sustainable Business Model by Using Data Analytics: A Short Guide for SMES	Article	This article provides guidelines for integrating data into SMEs.
Where Heritage Meets Innovation: CRAFT-IT4SD Pilots Crafting a Circular and Sustainable Future	Article	This article provides an overview of CRAFT-IT4SD´s second iteration pilot activities, including those focused on legislation.

MODACC, The Catalan fashion cluster drives sustainability with the training series «From challenge to opportunity»	Article	The article outlines Moddacc's approach to capacity building via workshops and specialized training
D4.2 Initial Report of the Pilots (Chapter 2.3)	Report Chapter	Detailed description of the first pilot iteration focusing on strengthening the regulation-technology link, including objectives, methods, participants, and findings.
D4.3 Interim Report of the Pilots (Chapter 3.3)	Report Chapter	Detailed description of the second pilot iteration focusing on strengthening the regulation-impact link, including objectives, methods, participants, and findings.
D4.5 Final Report of the Pilots (Upcoming)	Report Chapter	Detailed description of the third pilot iteration focusing on regulation and business modelling, including objectives, methods, participants, and findings.
D1.5 Initial Policy Recommendations (Updated version upcoming)	Report	The report provides policy recommendations based on an analysis of existing policy papers, CRAFT-IT4SD findings, and interactions with sister projects and initiatives.
D5.2 Climate impact assessment of selected business models	Report	The report illustrates and applies Life-Cycle-Assessment as a method for measuring and understanding environmental impact.
Tecnomoda 360: a new event to rethink the future of fashion through technology and sustainability	Announcement	Technology Fair organized by Modacc to help connect fashion and textile companies with technology providers.

Table 5: Resources – Green legislation as innovation catalyst

5. Open Platforms for Collaborative Innovation and Data-Driven Services

This pathway addresses technology integration as an ecosystem and replication challenge.
Target Groups: Local and Regional CCSI-ecosystems; Local, Regional, and National Technology Infrastructures; Business and Innovation Clusters; Local, Regional, And National Industry and Business Chapters; Local, Regional, and National Policy Makers

Perspective

This pathway addresses technology integration as an ecosystem and replication challenge. Rather than presenting technologies as isolated tools, it focuses on how open platforms, data-driven services, NFC tags, AI, digital garment workflows, virtual presentation formats, sensory testing, material-first methods and shared learning resources can help CCSI actors collaborate around sustainability. The emphasis is on practical adoption, shared infrastructures and low-threshold experimentation, especially for micro-companies, SMEs, educators and ecosystem intermediaries.

Across the CRAFT-IT4SD pilots, this question emerged from practical needs rather than from a pre-defined technology agenda. Smaller actors in craft, fashion and textile ecosystems are increasingly expected to work with product data, sustainability information, digital documentation, emerging technologies, cultural heritage and regulatory requirements. However, many micro-companies, SMEs, craft practitioners and educators lack the time, resources, shared standards and technical capacity to do so alone.

Technology integration is understood here as the development of shared infrastructures for collaboration. These include open-access guidance documents, technology directories, DPP-like product pages, digital garment workflows, NFC-based storytelling, AI-supported design tools, biometric and sensory testing, material-first design methods, virtual presentation formats, learning resources, co-creation formats and lab-based facilitation. Their value lies not only in collecting data or introducing new tools, but in helping actors translate technologies and data into decisions, relationships, learning and sustainable practices.

Technologies should therefore be assessed not only in terms of functionality, but also through cost, usability, interoperability, data ownership, energy use, access to skills and compatibility with existing SME workflows. In this sense, open platforms and data-driven services are not only digital repositories, but decision support environments that help SMEs choose, test and adapt technologies in relation to concrete product, customer and sustainability needs.

Approach

This strand is grounded in four pilot cases: MODACC worked with regulatory guidance, impact measurement and SME-oriented open-access resources. TUIASI/REGINNOVA explored co-creation methods, additive manufacturing and the digitisation of heritage-based capsule collections. OAMK/Oulu tested the Open Connector Platform through an upcycled performance costume and DPP-like storytelling format, while also developing low- tech circular craft practices and accessible workshop formats. VIA explored responsible technology use through NFC, Generative AI, material driven design, biometric and sensory testing, lab-based learning and future-oriented textile tools. In this context, future oriented textile tools refer both to 3D fashion technologies, including body scanning, CLO3D and digitalisation workflows, and to 2D textile material technologies, including digital looms, digital Stoll knitting machines and digital printers used as industrial lab-scale tools for experimentation, prototyping and learning.

The strand overlaps with other parts of the playbook. It connects to green legislation because traceability, Digital Product Passports, green claims and impact measurement require structured product and sustainability data. Blockchain, NFTs and digital provenance platforms have also been identified as possible traceability and digital ownership layers. Their relevance for SMEs lies primarily in authenticity, repair and resale histories, provenance documentation, product lifecycle records and digital-physical product links. However, these technologies involve barriers such as

technical complexity, unclear costs, cryptocurrency volatility, platform reputation and energy use, and should therefore only be adopted where they create clear transparency or circular business value.

The strand also connects to learning communities because open resources and platforms can support peer learning and micro-credentials. It connects to circular and sufficiency-oriented business models because product information, storytelling, repair guidance and material knowledge can support longer product use and alternative value propositions. The specific focus here is the infrastructure and service layer: how open, shared and facilitated digital formats can help local CCSI ecosystems collaborate around sustainability without increasing the burden on smaller actors.

MODACC: open-access guidance for SME regulatory adaptation

The Catalonian pilot addressed a concrete problem: fashion and textile SMEs need to adapt to emerging European sustainability legislation, but many lack the internal capacity to interpret regulatory texts, identify relevant tools and translate compliance requirements into operational change. MODACC therefore worked with open-access guidance and data services to lower the threshold for SME adaptation.

In its second iteration, MODACC selected three legislative frameworks for implementation with SMEs: the Ecodesign for Sustainable Products Regulation, the European Climate Law, and the Directive on Substantiation of Green Claims and Empowering Consumers. These were selected because of their relevance, urgency level and complementarity for Catalan SMEs. MODACC then organised three in-person workshops structured around legislative explanation, capacity building, impact measurement tools, gamified application and practical roadmaps for internal implementation.

A key result was the open-access document *Unboxing Sustainable Fashion*, published in Catalan and English on the MODACC website. The document includes descriptions of selected legislative frameworks, timelines and scope of application, implementation roadmaps, available impact measurement tools and practical tips for integrating these tools into business operations. MODACC later confirmed that this document has proven useful for SMEs and can serve as a basis for replication in other pilot sites. MODACC also identified the living document *Sustainable Business Models in Catalonia*, developed under the third iteration, as a further open-access resource that may support replication.

MODACC's contribution should not be understood as a direct pilot of DPP platforms, AI systems or impact measurement technologies. Rather, the pilot focused on building the knowledge base that SMEs need in order to understand these technologies, assess their relevance and identify local suppliers or piloting options. For replication, this is important: open platforms do not need to begin as complex technical systems. They may begin as shared knowledge infrastructures, such as open-access documents, curated tool overviews, workshops, roadmaps, technology directories, matchmaking formats or living resources. The central value lies in translation: from regulatory and technical complexity into actionable steps that smaller companies can understand and use.

The case is also strongly context-dependent. MODACC emphasises that its pilot was built on a needs-based approach, beginning with focus groups and ecosystem mapping. The main lesson for other ecosystems is therefore not to copy the Catalan materials directly, but to know the local ecosystem, understand the needs of the target group, identify relevant stakeholder relations and select the value-delivery format most suitable for SMEs.

TUIASI/REGINNOVA: digital documentation of heritage-based fashion

The Romanian pilot addressed a different problem: how can traditional craftsmanship and cultural heritage remain relevant and inclusive in a contemporary fashion context shaped by digital technologies, sustainability concerns and changing modes of presentation?

The pilot, led by TUIASI and co-led by REGINNOVA, focuses on additive manufacturing and 3D printing for sustainable crafted capsule collections. It works with Moldavian cultural heritage and traditional craft, including motifs and references from traditional costumes, pottery, Easter eggs and Romanian artcraft. These references are translated into contemporary fashion collections enhanced by additive manufacturing and digital tools.

Several results are applicable for replication. These include the hands-on workshop format on additive manufacturing and 3D printing on flexible materials; the co-creation methodology combining artisans, students, designers, engineers, SMEs and TUIASI Fab Labs around heritage-inspired capsule collections; and the use of heritage motifs as design inputs for 3D-printed accessories, textile applications, digital embossing and embroidery.

Other results remain prototypes or work-in-progress. These include the digitisation of collections through digital files, photos, videos and patterns, and an interactive digital fashion show using digital avatars and fabric simulations. The pilot began digitising the collections using Style3D ASSYST, AI and VR-related tools to create digital garments,

avatars and fabric simulations. The Cucuteni garments were digitised using Style3D ASSYST, enabling reconstruction of physical garments in a virtual environment and supporting analysis of volumes, materials and behaviour. This work is best understood as a proof-of-concept and as groundwork for future virtual presentation formats.

Virtual presentation formats can broaden how craft processes, collections, studios, exhibitions and learning environments are documented and communicated. Formats such as 360-degree content, browser-based virtual spaces, virtual tours, XR environments and digital showrooms can make physical garments, cultural references and production contexts accessible beyond the immediate pilot setting, without requiring full-scale immersive infrastructure.

For replication, the TUIASI/REGINNOVA case shows that data-driven services can be embedded in design, learning and documentation workflows. Here, the platform logic is not only about compliance data or product registration. It is also about making craft processes, heritage references, garment construction, material behaviour and visual narratives shareable through workshops, exhibitions, digital garments, virtual prototypes, videos, process documentation and public validation.

The case also shows clear limitations. Some 3D printing materials still lack the flexibility, softness, washability and durability needed for traditional textile garments, and further testing is required on fabric adhesion and washability before wider use in wearable products. SMEs, artisans and students also needed support to translate traditional motifs into digital formats and adapt designs for 3D printing and AI-based visualisation. Access to specialised infrastructure, such as 3D printing, CAD and clothing manufacturing labs, may not be available to all micro-companies or craft practitioners.

A key lesson from the Romanian pilot is to treat heritage motifs as knowledge artefacts rather than merely decorative elements. When understood as carriers of cultural knowledge, traditional techniques, and local identity, these motifs become resources for design innovation that can be reinterpreted through contemporary digital tools while preserving their cultural significance. Replication should begin from a strong local learning community and involve craftspeople, designers, students, engineers, SMEs and cultural institutions. The specific symbols, motifs and collections should not be replicated directly, as they are embedded in their local cultural heritage ecosystems and carry context-specific cultural meaning. From an ethical perspective, replication should therefore focus on the underlying methodology of engaging with local heritage through co-creation and research, rather than reproducing cultural expressions developed in another regional context. Each CCSI ecosystem should identify its own craft traditions, materials, community partners, available labs and storytelling formats.

OAMK/Oulu: Open Connector and DPP-like storytelling

The Oulu pilot provides the clearest example of direct platform testing within this strand. The second pilot iteration at OAMK focused on integrating innovative technologies into craft and performance contexts while promoting sustainability and SME-friendly solutions. Activities included printed electronics in textiles, immersive visual programming with TouchDesigner, gamification and circular design approaches using recycled materials.

The central platform case is the *Sun Wind* performance and Open Connector test. OAMK created a dancer's dress using used coffee packaging, drawing on a traditional Finnish basket-weaving method. The dress was tested in the proof-of-concept *Sun Wind* performance at the Oulu Plenary Meeting in November 2025. The performance used TouchDesigner for audio-reactive and motion-tracked visuals, a Microsoft Kinect LiDAR camera to track the dancer's movements, and a LED wall and lighting system that reacted to the performance environment.

The video and selected photos from the performance were uploaded to the Open Connector Platform. OAMK created a product page for the *Sun Wind* dress, including a preview page and an OAMK CRAFT brand page. This made the garment, performance documentation and storytelling content accessible through a DPP-like platform structure. The Technology Scan Report provides a more detailed description of this workflow. Fashion and craft SMEs can create a Brand Showcase page, add products through the Products page, generate unique IDs for each physical item, encode these IDs into NFC tags, and connect products to Perks as bonus content. Perks may include behind-the-scenes images, videos, games, documentation or storytelling material.

The Open Connector Platform therefore works less as a closed content repository and more as a gateway between a physical product, a unique item ID, NFC interaction and externally hosted or platform-hosted digital content. The report also clarifies how the platform can support basic mini-DPP preparation. SMEs can use the product description field to record product information such as list of components, material of components, place of origin of components and place of assembly. This connects storytelling, product identity and future DPP-readiness within the same practical workflow.

OAMK's follow-up clarified that the most replication-ready elements are not the most technically complex ones. Circular craft practices such as fish leather tanning and the upcycling of coffee packaging into garments are highly transferable because they rely on low-cost, widely available or free materials and basic tools. Workshop-based learning formats on printed electronics, gamification and TouchDesigner are also ready for replication and can be translated into training activities or micro-credential courses. The use of open-access and low-cost tools, including TouchDesigner, web-based game engines and community-supported learning resources, supports transferability by reducing entry barriers for SMEs. Basic NFC-enabled storytelling, where garments are linked to digital content such as educational games or product information, was also successfully implemented and can be replicated, although the backend system requires further development.

At the same time, several results remain prototypes or work-in-progress. The Open Connector Platform is still in beta development, although the Technology Scan Report indicates that the Perks functionality has been updated and can now be tested by SMEs. Preview pages for products are live, while the public brand page is not yet fully live. The platform should therefore be described as a promising but still developing infrastructure, where bugs and limitations may still occur. Advanced wearable technologies, such as printed electronics integrated into textiles and interactive LED garments, also remain experimental due to power supply, battery performance, washing, durability and everyday usability challenges.

These limitations are relevant learning points for replication. They show that DPP-like systems for CCSI ecosystems must be tested with real creative artefacts, not only standardised demonstration products. Performance costumes, reused materials, video, movement, cultural storytelling, brand pages, NFC IDs and multimedia documentation create more complex platform requirements than ordinary product information fields.

The main lesson from OAMK is that successful replication depends on combining accessible, low-tech practices with gradually introduced digital innovation. Approaches that start from familiar craft methods and incrementally integrate digital elements are more effective for SMEs than technology-driven models. Workshop-based co-creation is also a critical success factor, as it supports skill development, cross-sector collaboration and network-building. The most transferable element of the OAMK pilot is therefore not one specific technology, but a process model based on co-creation, accessibility and gradual innovation.

VIA: responsible technology use and material-first data

The Danish pilot, led by VIA University College, contributes by showing how open platforms and data-driven services can be developed from situated craft practice rather than from technology alone. The pilot focuses on combining craft with digital technologies for sustainability in garment design and consumer approaches. Across its three iterations, VIA worked with future scenarios, Generative AI, NFC tags, material-driven design, biometric testing, lab-based learning, analogue-digital material exploration and body diversity through body scanning and 3D design tools.

The first iteration established the pilot's focus on future scenarios, AI and NFC tags as digital carriers, exploring how digital technologies could support product communication, consumer engagement and preparation for DPP-related forms of product information. In the second iteration, VIA worked through four lines of activation: lab work with micro-companies, student work with material-driven design (MDD4AT), AI-based print experiments using traditional patterns, and casein-based biomaterial development using traditional knowledge. This iteration generated substantial documentation, including onsite lab observations, practitioner interviews, photographs and videos, student process books, MDD4AT templates, material samples, prompts, planned eye-tracking data, sensory testing and NFC-related video documentation. The third iteration extended the pilot towards body diversity and empathic design, using body scanning, pattern and fabric digitisation, CLO3D and biometric testing to explore how micro-companies can combine craft knowledge, digital garment development and user-oriented design.

Several operational contributions are relevant for replication. The Textile Thing from the Future adapts a future-scenario game to textile and clothing contexts by adding textile-specific cue cards, a resource card and "re-growth" as an additional arc. The AI Rocket supports critical and professional use of generative AI in design processes, framing AI as a creative sparring partner rather than a replacement for the designer. VIA also worked with NFC tags through hands-on workshops for students and practitioners, with some micro-companies testing NFC-based interaction with potential customers.

The Technology Scan Report adds a broader distinction between online AI platforms and local AI tools. Online AI services may lower the threshold for text, image, video, audio and 3D content generation, but they also raise issues concerning data use, platform dependency, subscriptions, credit systems and undisclosed energy sources. Local and open-source tools may provide more control over unpublished designs, customer-related material and sensitive project data, but require stronger hardware and technical skills. This strengthens VIA's emphasis on critical and responsible AI use rather than treating AI as a neutral design tool.

A central contribution is Material Driven Design for Apparel and Textiles (MDD4AT), which offers a material-first model for working with existing, surplus, recycled, bio-based or otherwise constrained materials. VIA also developed a Sensory Box for testing respondents' tactile reactions to casein-based biomaterials through facial expression analysis and galvanic skin response. Forty-six respondents participated in this testing.

VIA's follow-up indicated that, from a research perspective, the relevant approaches are considered ready for replication, especially The Textile Thing from the Future, MDD4AT and empathic design.

Based on the available pilot material, the VIA case also contributes an important caution. Observations and interviews with micro-companies revealed that some technologies improved workflow or communication, while others were experienced as barriers to practitioners' embodied craft knowledge because unfamiliar digital tools could be more complex and time-consuming than established analogue practices. For replication, this means that responsible open platforms and data-driven services should not only organise final product data. They should support experimentation, material dialogue, critical AI use, sensory testing, NFC-enabled storytelling, lab-based learning, and the translation of craft and heritage knowledge into shareable formats without losing their situated character.

A key lesson from the Danish pilot is that digital technologies should be introduced as extensions of craft practice rather than as ends in themselves. Across the three iterations, the pilot demonstrated that tools such as AI, body scanning, NFC, digital patternmaking and biometric testing created the greatest value when they responded to practitioners' existing material knowledge, design processes and user needs. Conversely, technologies that disrupted established craft practices without clear practical benefits were less readily adopted. This highlights the importance of practice-driven rather than technology-driven innovation when combining craft, heritage and digital technologies.

Transferable Development Outcomes

Across the four pilots, the activities produced a set of transferable outcomes relevant to technology integration, open platforms and data-driven services. These outcomes should not be understood as one integrated platform, but as a distributed infrastructure of replicable tools, methods, data practices and collaborative formats that can be adapted by other CCSI actors, SMEs, educators and regional innovation ecosystems.

A first replication-relevant outcome is the development of accessible guidance formats for SMEs. MODACC's work with regulatory guidance, impact measurement and sustainable business model resources demonstrates how complex policy and sustainability frameworks can be translated into open-access materials that smaller companies can use as entry points for implementation. The transferable value lies beyond the specific cases, but more in the format: a modular, accessible and updateable knowledge resource that can help SMEs understand regulatory change, assess their own sustainability practices and identify practical next steps.

A second transferable outcome is the use of DPP-like and product-information demonstrators as learning infrastructures. OAMK's Open Connector test with the *Sun Wind* dress showed how product pages, brand pages, perks, unique IDs, multimedia documentation, NFC interaction and storytelling can be combined in a single workflow. The replication value of this result is that it demonstrates how SMEs and creative actors can experiment with product data before entering more advanced or compliance-heavy DPP systems. It also shows that future product-information infrastructures in fashion and textiles may need to accommodate cultural, visual and narrative content alongside technical product data. For other ecosystems, this provides a model for low-risk experimentation with traceability, consumer interaction and added-value services.

A third outcome is a transferable workflow for digital garment development and virtual presentation. TUIASI/REGINNOVA's work with digitised heritage-based garments, digital garments, avatars and fabric simulations demonstrates how craft-based fashion can be translated into digital formats for co-creation, documentation, training and future virtual presentation. Although some outputs remain prototype-based, the underlying method is replicable:

combining cultural research, co-creation, digitisation, 3D garment simulation and training activities in a structured workflow. This can be adapted by education providers, design schools, heritage actors and SMEs seeking to explore digital product development without separating it from cultural attribution and craft knowledge.

A fourth transferable outcome is the development of data-supported craft and material methods. VIA's work with NFC tags, AI Rocket, MDD4AT, Sensory Box, casein recipes and AI prompting for print patterns shows how data-driven and digital tools can support design decisions, material development, consumer response, critical AI use and heritage-based experimentation. OAMK's fish leather tanning, coffee-packaging upcycling, gamification and TouchDesigner workshops further show that circular innovation does not have to depend only on high-end digital infrastructure. The transferable lesson is that low-tech circular craft practices and accessible digital tools can be combined into workshop formats that are affordable, adaptable and suitable for SMEs, students and local creative ecosystems.

A fifth replication-relevant outcome is the creation of learning and capacity-building formats. OAMK's workshop materials on printed electronics, gamification and TouchDesigner, TUIASI/REGINNOVA's training workshop on additive manufacturing and 3D printing on flexible materials, MODACC's workshop material on norms and technologies, and VIA's MDD4AT, Textile Thing from the Future and empathic design approaches can all be adapted into micro-learning modules, professional training sessions or open educational resources. Their main value is not only the content produced in each pilot, but the possibility of turning pilot-based experimentation into repeatable learning formats for different regional and institutional contexts.

The pilots also generated transferable knowledge regarding barriers and implementation conditions. OAMK identified usability issues in Open Connector and limitations related to wearable electronics. MODACC identified limited SME skills, lack of financial resources, low adoption rates and reluctance to change in some companies. VIA identified tensions between digital tools and embodied craft knowledge. TUIASI/REGINNOVA identified the need for specialised infrastructure, material testing and careful cultural attribution when digitising craft-based fashion. These barriers are themselves replication-relevant because they clarify what future adopters must plan for: technical support, facilitation, training, realistic resource levels, ethical attribution and long-term platform maintenance.

The overall result of the activities is therefore not a single technical product, but a set of transferable building blocks for collaborative innovation and data-driven services. These include open-access guidance models, DPP-like demonstrator formats, digital garment workflows, material experimentation methods, low-threshold digital toolkits, workshop formats, training modules and principles for responsible technology use. Some of these are ready for direct replication as methods or formats, including MODACC's SME guidance approach, TUIASI/REGINNOVA's co-creation and workshop methodology, OAMK's low-tech circular craft and digital workshop formats, and VIA's MDD4AT, Textile Thing from the Future and empathic design approaches. Others require further development before wider transfer, especially long-term platform maintenance, public access to digital assets, cross-platform interoperability, robust DPP backend systems, advanced wearable technologies and evidence of SME adoption after the pilot phase.

Key Insights for Replication

Replication should begin with a concrete ecosystem need. For MODACC, the problem was that SMEs are challenged in interpreting legislation and impact measurement. For OAMK, it was how to represent an upcycled performance costume and its story in a DPP-like platform, while also making circular craft and digital experimentation accessible. For TUIASI/REGINNOVA, it was how to bring heritage-based fashion, additive manufacturing and digital documentation together through co-creation. For VIA, it was how micro-companies and students could use digital technologies, material knowledge and consumer-response data without losing the situated quality of craft.

A transferable process should therefore begin with ecosystem mapping: who the actors are, what data they already have, what they struggle to document, which technologies they can realistically use, and what decisions the platform or service should support. MODACC's follow-up strongly reinforces this point: other ecosystems should first know their stakeholders, understand the needs and challenges of their target group, identify how different stakeholder types can collaborate, and select the delivery format that creates real value rather than prioritising attendance KPIs alone.

Open platforms should also be treated as social infrastructures, not only technical systems. Across the pilots, platform-related work depended on facilitation, translation and trust-building. MODACC's workshops and open-access

documents worked because the cluster acted as an intermediary between legislation, tools and SMEs. VIA's lab-based learning worked because micro-companies could work with experts on their own materials and challenges. OAMK's Open Connector test generated learning because the platform was tested through a concrete artefact and performance context. TUIASI/REGINNOVA's work depended on co-creation between craftspeople, students, designers, engineers, SMEs, Fab Labs and cultural institutions.

Tools should be low-threshold and modular. Micro-companies and craft practitioners rarely have capacity to engage in large, complex digital transformation processes. A company should be able to use one guide, one product page, one template, one NFC experiment, one workshop or one lab session without needing to adopt a full platform ecosystem. This is especially important if platforms are intended to support SMEs with limited administrative, financial and digital capacity. OAMK's experience suggests that replication is strongest when low-tech craft practices are combined with accessible digital tools and gradual learning. The Technology Scan Report reinforces this by recommending that SMEs start with one small experiment, such as an NFC tag for one product, a digital care page, a 3D-printed repair part, a virtual prototype or one AI-assisted product text. This small-step logic allows SMEs to test value, usability and sustainability implications before investing in broader digital transformation.

Platforms should be tested with real artefacts and real users. The OAMK case shows that limitations only became visible when the team tried to upload video, create product and perk pages, publish changes and work with unique IDs for NFC tags. For CCSI ecosystems, real artefacts are often complex: garments may include reused materials, craft techniques, cultural references, repair possibilities, performance documentation, emotional value, maker stories and consumer interaction. Testing with real artefacts helps identify whether the platform can handle the knowledge that matters in craft, fashion and textile contexts.

Data should be connected to practical decisions. Data-driven services are only valuable if they help actors decide what to do: how to comply with regulation, document a sustainability claim, choose a material, design for repair, communicate craft value, test consumer response, reduce prototypes or prepare for Digital Product Passport requirements. Data should therefore not be collected for its own sake, but translated into concrete support for design, production, communication, learning and sustainability. SMEs should prioritise tools that allow data to be exported and reused across systems, preferably through common file formats. Product data, 3D files, images and customer-related information should not be locked into one platform if they may later be needed for documentation, collaboration, compliance, repair, resale or future DPP-related workflows. Interoperability is therefore not only a technical feature, but a condition for long-term autonomy, collaboration and reduced platform dependency.

Replication should preserve tacit and heritage knowledge in digital translation. Craft knowledge is often embodied, tacit and context-dependent. It may be held in hand techniques, material judgement, inherited motifs, local stories, repair practices, workshop routines and community relations. Digital documentation should therefore include formats such as images, video, interviews, annotations, process notes, cultural context, attribution and community validation. The Romanian pilot makes this particularly clear: heritage motifs should be treated as knowledge artefacts, not only as decoration, and should not be transferred without local interpretation and collaboration with cultural custodians.

Several barriers may hinder replication. Micro-companies often have limited time, staff, financial resources and digital skills. Product and sustainability data are often fragmented. Platform usability can be a concrete barrier, as shown in OAMK's Open Connector test. Immature backend systems, unstable publishing functions and missing features may reduce the immediate usability of platform prototypes. Advanced wearable technologies introduce further challenges related to battery capacity, washing, durability and technical maintenance. MODACC also highlights that some SMEs are reluctant to change established processes, particularly when digital and impact measurement tools are perceived as costs rather than investments. Digital tools can disrupt craft practice if introduced without sufficient support, as VIA's observations show. Heritage-based digitalisation requires cultural attribution and ethical interpretation, as shown in the Romanian pilot. The Technology Scan Report also identifies business model mismatch as a barrier: some technologies may be impressive but unsuitable for the SME's actual products, customers or resources. Technology adoption should therefore begin with a business and product question rather than with the tool itself. Finally, evidence of long-term adoption remains limited. The pilots provide tested components and transferable principles, but not a fully consolidated open platform model.

Related Resources

The following selected resources were developed or adapted within CRAFT-IT4SD to illustrate the use of digital plattforms, data, and technology in a broader sense within CCIS (Table 6).

Resource	Type	Description
Additive Manufacturing and 3D printing for a sustainable crafted capsule collection	Article	Showcasing effectual value creation in the form of developing a capsule collection by combining tradition, sustainability, and technology.
From Tradition to Innovation by Integrating 3D printing and Sustainable Craft Development	Article	Illustrates the intersection of heritage, sustainability, and innovation in the textile and fashion sector, illustrating how these dimensions can converge through the application of 3D printing technologies.
Traditional knowledge meets tomorrow's wardrobe for sustainability	Article	Showcasing effectual value creation in the form of circular textile design using fish leather, recycled fishing nets, and printed electronics.
Combining Craft with Digital Technologies for Sustainability in Garment Design and Consumer Approaches	Article	Showcasing effectual value creation with micro-companies, combining hands-on experimentation with different materials, techniques, and technologies, consumer engagement, and heritage revitalization.
Value Validation through Biometric Methods	Article	How consumers interact with materials, NFC tags, and a printed guides, capturing visual attention and behavioral responses in real time. This approach provides valuable insights into how customers perceive and engage with crafted textile products and digitalized communication.
Reimagining Cultural Heritage Through Sustainable Approaches Using 3D Printing Technologies	Article	Features and principles behind combining heritage and technology in fashion
Can we train Future Artisans to bring Sustainable Solutions to Create Communities?	Article	How new technologies can be fused with traditional craft as a model for the future.
The AI rocket - A Professional Approach to Generative AI	Article	The why and how of facilitating generative AI workshops for students and micro companies as professional tool in design processes
Data Case Book for the Sustainability Transition	Report	The report explores how data and digital platforms can drive sustainable transformation within the Cultural and Creative Sectors and Industries (CCSI), with a particular focus on fashion and craftsmanship
Technology Scan Report	Report	Presents and evaluates selected data platforms and tools for SMEs in fashion, design and craftsmanship, explores how data-driven approaches can support the green transition, identifies key challenges and opportunities associated with adoption
Open Connector Platform	Digital Tool	Open platform that connects designers, manufacturers and consumers, serving as a product information hub. In addition, perks can be created to create additional value and content for clothing and craft items. The platform

		takes advantage of physical Near Field Communication (NFC) tags.
Improving the quality of recycled PLA filament: Effects of extrusion speed and cooling conditions	Conference Publication	Software for audio-reactive and motion-tracked visuals used to digitally support art performances.
Sustainable 3D-Printed Biocomposites: Effect of Cotton fabric Reinforcement on Flexural Properties	Conference Publication	Open platform that connects designers, manufacturers and consumers, serving as a product information hub. In addition, perks can be created to create additional value and content for clothing and craft items. The platform takes advantage of physical Near Field Communication (NFC) tags.
3D Print With No Regrets for Fashion and Crafts SMEs	Article	The study investigates how adjusting these parameters can improve filament uniformity, addressing the challenges posed by the rapid growth of 3D printing activities and the subsequent increase in plastic waste. The results provide valuable insights for professionals looking to enhance the quality of recycled PLA filament in small-scale recycling setups, contributing to more sustainable and efficient 3D printing practices.
Digital Transformation as a Catalyst for Change for Micro-Companies and SMEs	Article	This study investigates the potential of cotton fabric-reinforced polylactic acid (PLA) composites, fabricated via desktop fused deposition modelling (FDM), to enhance flexural performance and enable the production of functional, load-bearing parts using biodegradable materials. The findings support the feasibility of producing stiffer, stronger, and more durable components within a biodegradable materials system, offering a practical route toward sustainable, function-oriented additive manufacturing.
Bright Ideas: Sustainable LED Tech for Fashion and Performance	Article	Short "no-regrets" guide for SMEs on technology piloting with 3D printing as example
Digital Carriers – Putting NFC into Action to Explore and Unlock Value Creation Potential	Article	Using workshops to introduce students and businesses to NFC technologies and reflects on the lessons learned.
Linking technological advances and cultural heritage: the case of CRAFT-IT4SD project	Sc. Publication	The study demonstrated a feasible methodology for integrating heritage-based inspiration with digital fabrication to generate contemporary, sustainable fashion concepts. Through 3D printing and additive manufacturing, the collection demonstrated how technology can transform fashion, making it more sustainable, expressive, and connected to cultural roots.

Table 6: Resources – New business models for circularity and sufficiency (causation-oriented pathway)

6. Learning communities as inclusive structures for capacity building and skills integration

This pathway addresses cross-sectoral capacity building and learning communities for CCSI Ecosystems

Target Groups: Local and Regional CCSI-ecosystems; HE Institutions and VET-providers; Cultural and Industrial Heritage Holders; Craft and Living Heritage organisations; Business and Innovation Clusters; Local and Regional Education Policy Makers

Perspective

Strengthening skills and capabilities is a central objective of CRAFT-IT4SD, and closely connected to all other strands of the project. However, the project's perspective extends beyond the delivery of training. Rather than viewing skills development as an individual or institutional learning process, CRAFT-IT4SD approaches it as a means of strengthening ecosystems and enabling collective responses to sustainability challenges.

CRAFT-IT4SD is guided by the overall mission of leveraging the CCSI as drivers for the European green transition, taken on through a holistic approach towards the triple transition: green, social, and digital. To further this while also understand how to build capacity for the mission, CRAFT-IT4SD builds on a 360-degree CCSI-ecosystem approach (D7.3), as we consider the CCSI Ecosystems to be holistic, long-term and relational dynamics, with a richness of actors and narratives that draw on local (industrial) heritage, craft legacies and material knowledges. CRAFT-IT4SD's pilots constitute such ecosystems, rooted in local ecosystemic identities as textile- and garment-producing regions with a rich material, crafts, and trade history, lending identity to local (and often generational) companies and to the regions as such, as well as to local higher education and vocational training institutions, which to a still larger degree rely on local crafts narratives and test local resources. Building capacity with such ecosystems exactly has the potential of revitalising heritage environments in new capacities drawing on crafts, cultural and material practices (living heritage) to engage ecosystem actors in transitioning towards green and social innovation.

However, the CCSI are characterized by a high degree of fragmentation, with many actors operating in small organizations, temporary collaborations, or informal networks. While this diversity can be a source of creativity and resilience, it can also limit the sector's ability to collectively address systemic challenges such as the green transition. Adopting new sustainability requirements, digital technologies, or circular business models require knowledge and capabilities that often extend beyond the expertise of individual organizations or practitioners. Consequently, developing these capabilities becomes not only an educational challenge but also an ecosystem challenge.

From this perspective, learning communities represent more than platforms for knowledge exchange. They create spaces in which practitioners, researchers, technology providers, educators, local authorities, and other stakeholders can jointly interpret emerging developments, exchange experiences, experiment with new ideas, and develop shared understandings of future challenges and opportunities. In doing so, they strengthen not only individual competencies but also the relationships and collaborative capacity that enable entire ecosystems to respond to and even drive change.

Beyond strengthening ecosystem collaboration itself, CRAFT-IT4SD views lifelong learning as a prerequisite for enabling CCSI to actively contribute to ongoing societal transformation. Digitalization, sustainability challenges, and geopolitical developments are reshaping creative practices, technologies, markets, and policy environments. Consequently, the knowledge and competencies required by CCIS actors cannot be treated as static but must evolve alongside these changes.

CRAFT-IT4SD's perspective thereby reflects a shift in how learning itself is understood. Traditional training formats remain important for transferring knowledge but are often limited in their ability to foster sustained interaction, peer learning, and cross-sector collaboration. CRAFT-IT4SD therefore emphasizes learning as an ongoing, participatory,

and practice-based process that is embedded within existing networks and strengthened through continuous interaction. The objective is not to simply provide content and training but to cultivate self-sustaining learning communities that continue generating knowledge, collaborations, and innovation beyond the lifetime of the project.

However, the challenge extends beyond keeping pace with emerging developments. The triple transition should not be something that happens *to* the cultural and creative sectors; it should be something they actively shape. This requires practitioners, designers, artists, craftspeople, entrepreneurs, educators, and supporting institutions to develop the understanding necessary to interpret emerging developments, critically engage with them, and integrate new approaches into their own creative and professional practices. Lifelong learning therefore becomes a means of strengthening agency as much as the relevance of the sector.

From this perspective, ecosystemic learning communities serve a dual function. They facilitate the continuous acquisition of new knowledge and skills while simultaneously creating spaces in which participants collectively reflect on emerging challenges, exchange experiences, and influence the future direction of their ecosystem. Rather than separating learning from practice, CRAFT-IT4SD integrates learning into ongoing hands-on activity and collaboration, allowing knowledge to evolve alongside experimentation and innovation.

Moreover, to address the central challenge of fragmentation of the CCSI outlined at the beginning of this section, CRAFT-IT4SD recognizes that valuable knowledge often remains embedded within local ecosystems and therefore has limited potential to benefit the wider CCSI landscape. The project therefore seeks to capture localized learning and translate it into formats that can travel across organizational, regional, and disciplinary boundaries while remaining flexible enough to be adapted to different contexts. To this end, CRAFT-IT4SD adopts micro-credentials as a mechanism for structuring and recognising competencies acquired through project activities, notably across multiple institutions and actors. By packaging localized knowledge into modular, competency-based learning units, micro-credentials support lifelong learning while flexibly enhancing the transferability and recognition of emerging skills across organizations, sectors, and national contexts.

From a replication perspective, the primary transferable element of this strand is not a specific training programme, educational platform, or certification system, but the mechanisms that enable learning communities to emerge and evolve from CCSI ecosystems. Successful replication depends on creating the conditions for meaningful interaction, continuous skills development, collaborative knowledge creation, and collective problem-solving, supported by relevant content, flexible recognition mechanisms, and facilitation that responds to the evolving needs of the ecosystem. In this way, skills development becomes both an outcome of collaboration and a catalyst for strengthening resilient, self-sustaining ecosystems capable of actively contributing to ongoing technological, cultural, and sustainability transitions.

Approach

CRAFT-IT4SD's approach to developing learning communities and educational resources comprises a set of interconnected mechanisms that progressively transform localized knowledge into structured, transferable resources for knowledge and skills development across Europe's CCSI. A comprehensive description of the approach, its implementation, and its outcomes is provided in Deliverables 6.1 and 6.2, the latter placing particular emphasis on replication, and in 6.3. an interactive playbook with training sessions edited into open education resources on a learning platform. The following sections therefore do not seek to reproduce these deliverables but instead provide a concise overview of the approach, highlighting the elements and interactions that are most relevant for understanding and replicating the underlying model.

CRAFT-IT4SD's approach to strengthening skills development and knowledge exchange within and across Europe's CCSI can be conceptualized as a **double-loop model** through which knowledge is continuously generated, refined, consolidated, and disseminated over the course of the project's three pilot iterations (Figure 12).

The **first-tier loop** focused on capturing, validating, and disseminating the knowledge that emerged from pilot sites and work package activities. To ensure that these insights did not remain confined to their local contexts, CRAFT-IT4SD began its learning journey by establishing an (online) learning community, the dynamic character of which

was secured by activating the CRAFT-IT4SD LinkedIn-profile. Rather than serving solely as a dissemination platform, the community fulfilled three complementary functions. First, in combination with the CRAFT-IT4SD website, it acted as a structured repository that systematically captured and organised the knowledge generated throughout the project. Second, it provided a space for interaction, networking, and community building among CCSI stakeholders. Third, it enabled the continuous refinement of the project's knowledge base through discussion, feedback, and the exchange of additional experiences and expertise. In this way, the learning community functioned as both a living archive and a collaborative environment extending its reach and feedback-machanisms, ensuring that localized knowledge could progressively evolve into shared and transferable learning.

In parallel to the activities of the online learning community, selected training workshops acted as the second key mechanism for translating localized knowledge into shared learning experiences. Organized primarily at the end of each pilot iteration, they brought together project partners and external stakeholders to discuss and expand upon pilot experiences, exchange good practices, and collectively validate emerging insights. Closely aligned with the progression of the pilot activities and promoted through the learning community, the workshops created strong synergies between local experimentation, direct stakeholder engagement, and online knowledge exchange. The knowledge, discussions, and feedback generated during the workshops fed directly into CRAFT-IT4SD's evolving knowledge base and informed the development of learning resources shared through the online community. At the same time, the workshops provided an opportunity to validate pilot and work package outcomes, identify new learning needs, and refine subsequent activities, thereby closing the first-tier knowledge loop.

Building on the evolving knowledge base generated through the first-tier loop, the **second-tier loop** focused on consolidating learning into structured, lasting educational resources and establishing learning hubs for sustained capacity building (learning ecosystems). Drawing on insights from the pilots, workshops, and online learning community, dedicated Learning Ecosystem Teams (LETs) developed action plans that guided the design of micro-credentials and an interactive playbook. These action plans are a set of strategic priorities which guide the development of learning materials and training activities.

Following these action plans, the consortium developed a portfolio of guides, templates, training manuals, presentations, video lectures, learning games, and other interactive educational resources. These materials were organised into modular, micro-credential-based curricula to support flexible, blended learning, combining project-based knowledge with broader expertise while complementing traditional teaching through digital learning technologies. The learning resources were made freely available as Open Educational Resources (OERs) for teaching, learning, and research. In this way, localized knowledge generated through CRAFT-IT4SD was systematically transformed into structured, transferable educational resources that remain accessible beyond the project's lifetime, enabling knowledge and competencies to be shared and applied across organizations, sectors, and regions.

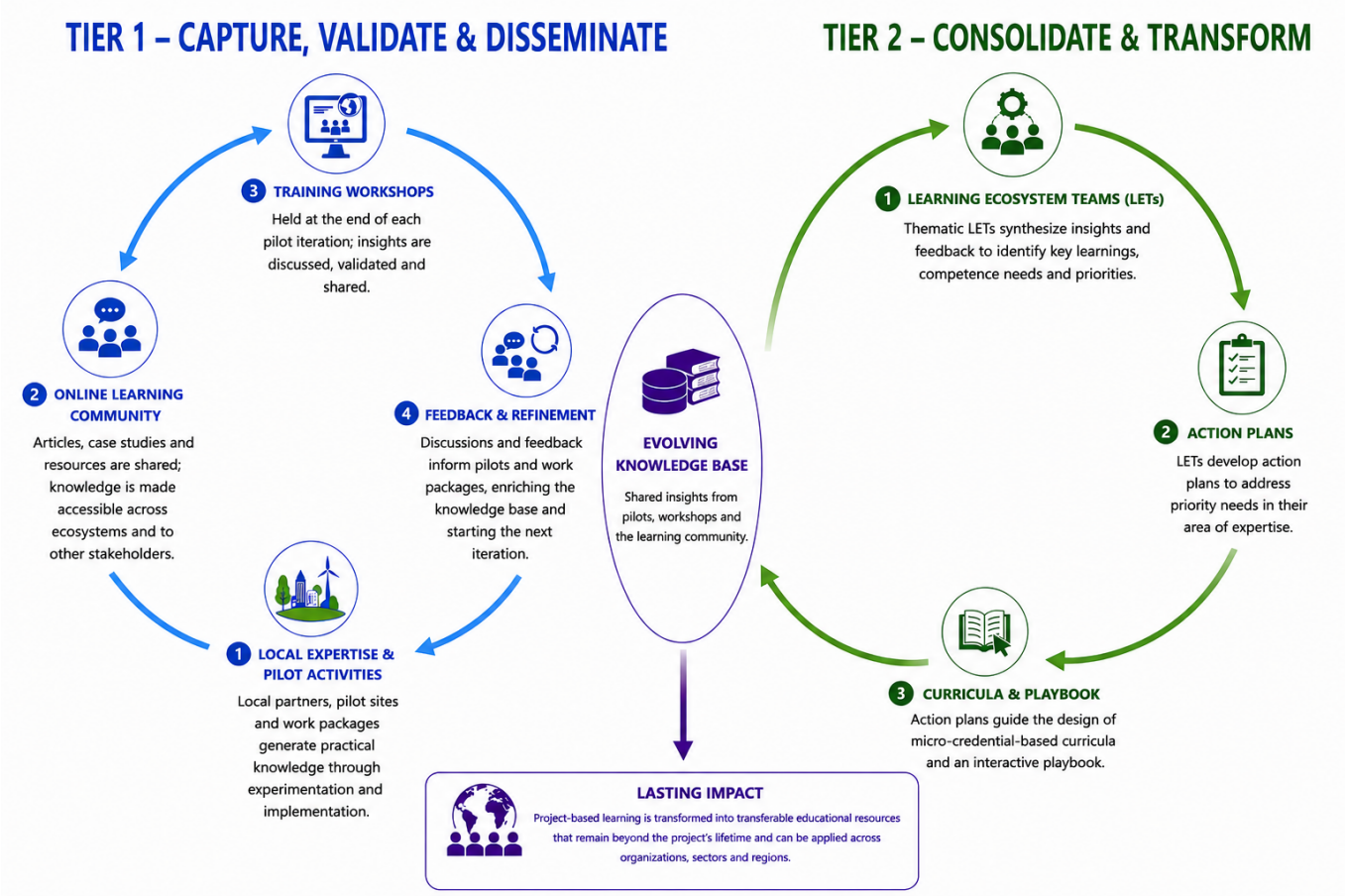

Figure 12: CRAFT-IT4Sd Model for moving to local knowledge generation to learning ecosystems

Tier One Loop: From Local Knowledge to Learning Communities

To strengthen skills development and foster collaboration within and across CRAFT-IT4SD's partner ecosystems, the project established pathways through which locally generated knowledge could be progressively captured, enriched, and shared. Central to this approach was the creation of the **CRAFT-IT4SD learning community**, which served as the primary hub for collecting and disseminating project-generated knowledge. By continuously integrating insights from pilots, workshops, and other project activities, the community evolved into a living knowledge base that not only accumulated learning resources and practical experiences but also facilitated discussion, reflection, and feedback among CCSI actors. In this way, it functioned as a dynamic archive that documented and continuously refined the knowledge generated throughout the project.

The CRAFT-IT4SD learning community, established at the beginning of the project, is structured around four thematic focus areas following the expert foci of the CRAFT-IT4SD pilots: innovative business models, wardrobes for sustainability, empowering consumers, and crafts and emerging technologies. Rather than developing a dedicated platform from scratch, the project chose LinkedIn as the primary interaction space, complemented by a repository of learning resources hosted on the CRAFT-IT4SD website. This approach lowered barriers to participation by engaging stakeholders through an existing professional network while avoiding the need to recreate functionalities already available. The communities were intentionally designed to remain open to a broad range of participants, including students, practitioners, researchers, educators, SMEs, technology providers, and other stakeholders, to foster cross-sector dialogue and networking across disciplinary and regional boundaries. Each community was coordinated by a thematic moderator from the consortium, supported by content creators and collaborators, who facilitated discussions, curated and shared project resources, encouraged participation, and promoted project activities. To ensure that the communities remained relevant and responsive, their development followed an iterative approach, with regular feedback and monitoring informing the continuous refinement of community structures, content, and facilitation throughout the project.

Training workshops formed the central bridge between local experimentation and the CRAFT-IT4SD learning community. They acted as a complementary dissemination channel by making emerging knowledge immediately accessible to local and European stakeholders through interactive, hands-on learning experiences, while simultaneously generating the resources and insights that subsequently enriched the online learning community.

Building on the expertise of the four pilot ecosystems and the wider consortium, they fostered cross-sectoral skills development and multidisciplinary collaboration by enabling participants to share pilot experiences, exchange good practices, discuss emerging insights, and collectively reflect on project outcomes. Rather than following a predefined curriculum, each workshop evolved alongside the pilots, ensuring that its content reflected the latest experimentation, project results, and stakeholder needs.

The workshops also served as experimental learning environments for students, educators, researchers, designers, craftspeople, entrepreneurs, SMEs, technology providers, and other stakeholders to test learning formats and provide feedback. Conducted in face-to-face, online, or hybrid formats and in the languages most appropriate for their audiences, they enabled broad participation while generating documentation that could be shared across the consortium and beyond.

To maximise their impact beyond the individual events, workshops were systematically documented in accordance with the project's ethical framework. These outputs fed directly into research publications, policy recommendations, and the project's growing portfolio of open educational resources. Across successive pilot iterations, the workshops therefore functioned not only as capacity-building activities, but also as a recurring mechanism for capturing, validating, and refining the knowledge emerging from the project.

The knowledge disseminated through workshops and the online learning community was directly grounded in CRAFT-IT4SD's pilot activities and transversal work packages. Rather than treating learning as a stand-alone activity, the project embedded it throughout the piloting process, making local experimentation the primary source of educational content. Knowledge, experiences, and good practices generated through pilot activities were systematically captured, reflected upon, and translated into learning resources for dissemination across the wider European CCSI community. At the same time, CRAFT-IT4SD sought to activate existing knowledge and educational capacities that often remain confined to individual institutions, disciplines, or stakeholder groups. Rather than creating entirely new learning offers, partners were encouraged to build on and extend their existing expertise, courses, and workshop formats to new audiences and contexts. This not only broadened participation but also enriched the project's evolving knowledge base, creating a continuous link between local ecosystem activities, collaborative learning, and transnational knowledge exchange.

For example, building on its expertise in sustainability regulation, Modacc engaged extensively with its local business ecosystem not only to share knowledge, but also to identify emerging needs, gather practical insights, and refine its understanding through continuous dialogue. These localized learnings were subsequently translated into broadly applicable, practice-oriented learning resources tailored to the needs of European fashion and textile companies (see also chapter on “Green Legislation as Catalyst for Innovation”). Similarly, during the first pilot iteration, VIA UC built on its expertise in NFC technologies and artificial intelligence by expanding workshops beyond its own institution and student body to engage local (micro-)companies. This not only broadened access to specialist knowledge but also enriched the project's evolving knowledge base through the exchange of practical perspectives and experiences.

Tier Two Loop: From knowledge portfolio to structured micro-credentials

Building on the knowledge continuously generated, validated, and disseminated through the Tier 1 loop, the second tier focused on consolidating this evolving knowledge base into structured educational resources designed to support lifelong learning beyond the project's duration. The resulting portfolio comprises training manuals, case studies, video lectures, learning games, and other interactive materials, collectively forming the educational foundation of the CRAFT-IT4SD learning ecosystem. Structured around the project's four thematic action areas, these resources support capacity building in sustainability, innovation, business modelling, consumer empowerment, and the integration of crafts with emerging technologies.

To ensure flexibility and long-term applicability, the knowledge generated through the pilots, transversal work packages, and the learning community interactions was synthesized with further relevant domain expertise and structured into micro-credential-based curricula. These curricula focus on discrete, competency-based learning units that enable learners to acquire and demonstrate specific skills relevant to the green and digital transitions. Their modular structure allows the learning offer to respond to emerging industry needs while supporting lifelong learning and integration into both formal and non-formal educational contexts.

The development of the micro-credentials followed an iterative process of conceptualisation, design, testing, and refinement. Drawing on the evolving knowledge base generated through the pilots, training workshops, and online learning community, the curricula were continuously enriched and validated through participant feedback and the insights emerging from successive pilot iterations. This ensured that the learning content evolved alongside the project, remaining firmly grounded in practice rather than being developed independently of it.

To promote consistency and transferability, all curricula were developed according to a common framework aligned with the European qualification levels, credit requirements, and additionally micro-credential guidelines. Each micro-credential specifies its learning outcomes, expected workload (ECTS), qualification level, assessment approach, participation requirements, and quality assurance measures. At the same time, the content reflects CRAFT-IT4SD's broader methodological approach by combining sustainability, craftsmanship, innovation, collaboration, design thinking, and hands-on experimentation within flexible, practice-oriented learning pathways.

Finally, to consolidate the knowledge generated throughout the project and facilitate its transfer beyond the consortium, CRAFT-IT4SD is developing an **interactive playbook (D6.3)**. While the learning resources focus on developing specific competencies, the playbook captures the project's overarching methodologies, processes, and lessons learned, providing practical guidance for applying the CRAFT-IT4SD approach in other contexts.

The playbook brings together experiences from pilot activities, transversal work packages, action plans, and learning ecosystems, documenting the project's design journeys, good practices, and skills-related outcomes. It also provides recommendations on training, up- and reskilling, the integration of learning into formal education, and knowledge transfer across traditional fashion professions and emerging creative practices.

Its development follows a progressive process in which insights from the pilots are first consolidated, then combined with the project's approaches to ecosystem development and capacity building, before being translated into practical recommendations for future implementation. In doing so, the playbook serves as the project's primary vehicle for transferring its methods, learning materials, and accumulated experience to educators, practitioners, and organizations seeking to establish similar learning ecosystems.

Transferable Development Outcomes

CRAFT-IT4SD's model provides a transferable blueprint for capturing locally generated knowledge and transforming it into structured learning resources that strengthen skills development and ecosystem collaboration. While the project was designed as an integrated model in which the different elements reinforce one another, each element also provides value independently. The following sections therefore first discuss the replication value of the individual mechanisms before considering their combined effect.

The primary contribution of the first-tier loop is that it establishes a formalised pathway through which knowledge generated during experimentation is systematically captured, processed, and translated into resources that benefit a wider audience. This is particularly relevant for the CCSI, where learning often emerges through experimentation, trial-and-error, and tacit experience. Without deliberate mechanisms for documentation and translation, many valuable insights remain local, informal, and ultimately disappear. CRAFT-IT4SD addresses this challenge by ensuring that knowledge generated through pilots is not simply documented, but immediately transformed into articles, workshop content, and other learning resources intended for external use. This requirement fundamentally changes the way knowledge is captured: rather than documenting activities for archival purposes, partners must organise and communicate their insights in ways that are meaningful, accessible, and transferable to others.

The model immediately places captured knowledge into a structured thematic context. By organising learning around four overarching themes, newly generated content is categorised, contextualised, and connected to related resources from the outset. This significantly reduces the effort required to consolidate knowledge later while simultaneously creating coherent learning pathways that can continue to grow as additional insights emerge.

Beyond knowledge management, the first-tier loop also creates the social infrastructure required for continuous learning. The learning community provides actors from across the fragmented European CCSI landscape with a shared space for exchanging experiences, discussing emerging challenges, and collectively shaping future directions. Rather than treating dissemination as a one-way process, the model creates opportunities for practitioners, educators, businesses, researchers, and other stakeholders to actively contribute their own perspectives and identify emerging competence needs. In this way, knowledge sharing becomes participatory not transactional, helping to strengthen the ecosystem itself while informing future pilot activities.

Relatedly, the close interaction between pilots, workshops, and the learning community establishes multiple opportunities for continuous validation and refinement. Feedback collected through workshops, community discussions, and stakeholder engagement not only improves the quality and relevance of the learning resources but also informs subsequent pilot iterations. Rather than viewing dissemination as the endpoint of innovation, CRAFT-IT4SD embeds it within an iterative learning process in which knowledge is continuously challenged, enriched, and improved before being consolidated into more permanent educational resources.

Whereas the first-tier loop establishes mechanisms for generating, capturing, and refining knowledge while fostering a learning community around it, the second-tier loop focuses on transforming this evolving knowledge base into structured, transferable educational resources. Its primary replication value therefore lies not only in preserving project outcomes, but in systematically translating localized experimentation into lasting capacity-building materials that can be adopted and further developed beyond the project itself.

A particularly transferable outcome of this process is the use of micro-credential-based curricula. While micro-credentials are only one possible way of preserving and disseminating knowledge, they provide a flexible and future-oriented mechanism for packaging competencies into modular learning units that can easily be updated, combined, and adapted to different contexts. Rather than focusing on comprehensive qualifications, they recognise specific competencies relevant to emerging technological, sustainability, and creative challenges, making them particularly well suited to rapidly changing sectors such as the CCSIs. Their modular nature also allows innovative educational approaches, including interactive workshops, project-based learning, interdisciplinary collaboration, and design thinking, to be integrated. As such, the micro-credentials developed in CRAFT-IT4SD provide a transferable educational model that can be adopted by higher education institutions, vocational education and training providers, SMEs, and lifelong learning organisations[3].

Closely related to this is the establishment of common educational principles and standards that extend beyond individual learning materials. By following a shared development process, all micro-credentials are based on consistent pedagogical principles while remaining adaptable to different thematic contexts. Across all learning units, theoretical foundations are combined with practical application through workshops, collaborative projects, prototyping, peer learning, and real-world case studies. Learners are encouraged to move iteratively between conceptualisation, experimentation, evaluation, and refinement, closely reflecting innovation processes in the cultural and creative sectors. From a replication perspective, this shared educational philosophy is as valuable as the learning materials themselves, as it enables different ecosystem actors to develop compatible educational offers while maintaining flexibility to respond to local needs.

Perhaps the most important replication insight, however, emerges where the two loops intersect. The continuous interaction between the knowledge-generation mechanisms of the first tier and the educational development mechanisms of the second ensured that the resulting learning resources were never detached from practice. The Learning Community, the European Training Workshop Series, and pilot ecosystems continuously supplied experiences, stakeholder perspectives, and feedback that informed the development of the curricula and other educational re-

[3] For a detailed overview of the expected impact of the specific learning resources created within CRAFT-IT4SD, please see section 4.2 of deliverable 6.2

sources. Conversely, draft learning materials, pedagogical approaches, and competency frameworks were repeatedly tested and refined through pilot activities, workshops, and stakeholder engagement before being consolidated. This continuous feedback loop transformed research findings and local experimentation into educational resources that were both technically robust and pedagogically validated.

As a result, the educational resources developed within CRAFT-IT4SD are characterised by a high degree of practical relevance and applicability, increasing their potential for adoption by educational institutions, businesses, and other organisations. At the same time, the collaborative processes through which these resources were created strengthened relationships among participating actors, reinforced the learning community, and established a shared understanding of emerging competencies and educational needs that can continue to evolve beyond the lifetime of the project.

Key Insights for Replication

The preceding sections described CRAFT-IT4SD's approach to developing learning communities and managing the flow of knowledge from local experimentation to lasting educational resources. As illustrated, the model's interconnected elements create multiple synergies that contribute to stronger learning communities, more robust knowledge capture, and sustainable capacity building. However, successful replication depends on more than simply reproducing these individual elements. Reflecting on our experiences throughout the project, we identified a number of considerations and principles that explain why the approach worked in practice and can help others adapt it effectively to their own contexts.

A key strength of CRAFT-IT4SD's approach is that it is layered onto existing innovation, research, or other development activities without fundamentally changing how they operate. Rather than replacing established processes, it provides a complementary framework that systematically captures, structures, and disseminates the knowledge emerging from them. Whether applied to pilot activities, research projects, company innovation processes, or other forms of experimentation, the model enhances existing practices by ensuring that valuable insights are not lost but continuously translated into resources that benefit a wider community as well as the innovator.

This layering idea is based on the recognition that learning does not happen after innovation, but is an inherent part of it. Likewise, both innovation and learning are continuous rather than one-off processes. Accordingly, CRAFT-IT4SD embedded mechanisms for knowledge capture, reflection, and dissemination directly into the piloting process, allowing experimentation to continuously generate learning insights while subsequent feedback informed further experimentation. Designing for this duality and continuity is a critical replication lesson. It ensures that knowledge does not remain isolated within individual activities but is repeatedly applied, challenged, refined, and consolidated, resulting in a knowledge base that continuously improves over time[4]. Because these mechanisms complement rather than disrupt existing innovation processes, they can readily be integrated into a wide range of organisational and project contexts.

However, although learning naturally accompanies innovation, this does not mean that the systematic capture and translation of that learning happens automatically. Particularly within the context of CCSI, knowledge is frequently generated through experimentation, tacit experience, and situated interactions (Link deliverable 2.2). As a result, valuable insights can easily remain undocumented or become detached from their original context, limiting their usefulness beyond the immediate activity.

For this reason, CRAFT-IT4SD deliberately integrated structured mechanisms for capturing and managing knowledge into the project from the outset. Specifically, the project established clear processes that specified why, how, when, and by whom knowledge should be captured, validated, and transferred into workshops, learning communities, and educational resources. A dedicated work package, methodological playbook, regular coordination meetings, and clearly assigned responsibilities ensured that knowledge continuously moved through the different

[4] For an overview of this knowledge base see delivery 6.2, table 2.2, as well as under the corresponding development strand in this report.

stages of the learning model instead of remaining isolated within individual pilots or work packages. From a replication perspective, an important lesson is therefore that knowledge capture should be treated as a core project process rather than a peripheral dissemination task.

Balancing structure and flexibility raises as an important challenge. While CRAFT-IT4SD strongly emphasised bottom-up innovation and decentralized experimentation, it also recognised that such openness could make systematic knowledge capture difficult. To address this challenge, the project's approach separates the management of the process from the content. Partners retained full ownership over the knowledge generated within their thematic areas, while the mechanisms for documenting, sharing, and refining that knowledge were standardised across the consortium (link deliverable 6.1). Importantly, responsibility for these mechanisms rested with the subject-matter experts themselves rather than being imposed through a top-down management structure. For example, pilot and work package leaders also acted as moderators of the learning communities and members of the Learning Ecosystem Teams, ensuring that the educational resources remained authentic to the underlying practice while fitting coherently into the project's overall learning architecture. This combination of decentralised content creation and centrally coordinated knowledge processes proved essential for maintaining both creativity and coherence throughout the project.

Regarding the transition from localized insights to structured, transferable educational resources, two considerations proved particularly important. First, the double loop approach separates knowledge capture from knowledge formalization. The learning community and training workshops created an intermediate stage in which insights could be documented, discussed, and refined without prematurely forcing them into rigid educational formats. Only once they had been validated through repeated application, stakeholder feedback, and integration into the broader project knowledge base (loop 1) were they consolidated into structured learning resources such as micro-credentials (loop 2). From a replication perspective, this staged approach avoids formalising knowledge too early while ensuring that valuable insights are not lost. Second, the existence of the learning community and training workshops gave knowledge capture an immediate purpose. Rather than documenting experiences solely for reporting purposes, partners knew that their insights would be discussed with peers, presented in workshops, and transformed into resources for a wider audience. This not only increased motivation to capture knowledge but also improved its quality, as ideas had to be communicated in ways that were understandable, relevant, and useful to others. At the same time, discussions within these dissemination channels continuously enriched and validated the knowledge base before it was translated into more permanent educational resources.

Taken together, these two mechanisms allowed CRAFT-IT4SD to cast a deliberately wide net during the early stages of experimentation, capturing a broad range of experiences and insights before progressively filtering, validating, and synthesising them into coherent educational resources. The process resembles fishing with a large net before preparing the menu. First, you cast a wide net to ensure that no valuable catch is missed. Only afterwards do you sort, clean, and combine the best ingredients into dishes that suit different audiences. The important point is that nothing of value is lost, while the final menu remains carefully curated rather than overwhelming. In this way, the project maximised learning from local experimentation while ensuring that the final educational portfolio remained focused, relevant, and of high quality.

Finally, the most important outcome of this development strand extends beyond the educational resources themselves: the establishment of learning communities capable of strengthening Europe's fragmented CCSI ecosystems. Throughout this chapter, learning has been described as the catalyst that brings actors together. By creating opportunities to collectively explore emerging technologies, sustainability challenges, and new ways of working, CRAFT-IT4SD used knowledge exchange as a vehicle for building relationships, trust, and long-term collaboration. From a replication perspective, an important lesson is therefore to build ecosystem communities around valuable content and shared learning rather than around networking or communication alone. Meaningful interaction emerges when participants have something relevant to discuss, question, and jointly develop.

At the same time, communities require deliberate cultivation. One important insight from CRAFT-IT4SD concerns the choice of platform. Rather than investing resources in developing a dedicated online platform, the project deliberately built on LinkedIn because the target community was already active there and the necessary functionalities for interaction, moderation, and content sharing were readily available. Meeting participants where they already are

significantly lowers barriers to engagement and allows resources to be invested in community development rather than technical infrastructure.

Similarly, CRAFT-IT4SD demonstrated that strong learning communities grow by activating existing ecosystems rather than creating entirely new ones. Partners built on established relationships with local businesses, educational institutions, creative practitioners, and other stakeholders, gradually expanding these networks through meaningful collaboration. TUIASI in collaboration with the regional innovation cluster, REGINOVA provide a good example of this approach, actively identifying opportunities within its regional ecosystem and creating mutually beneficial activities that organically strengthened both its local network of designers, artists, artisans, heritage actors while expanding the reach and depth of the ecosystem, and the wider CRAFT-IT4SD learning community. Rather than attempting to build a community from scratch, the project expanded and connected communities that already existed, enabling them to evolve into a broader European learning ecosystem.

Finally, learning communities, whether online or offline, should be treated as active knowledge-processing spaces rather than one-way dissemination channels. The value of the learning community stemmed not only from sharing project results but from creating opportunities for participants to question, expand, and validate them. In this sense, the community contributed as much to improving the project's knowledge base as it benefited from it. VIA UC, for example, successfully combined outward-facing knowledge sharing with inward-facing learning by continuously incorporating insights from companies and collaborators into its own learning activities and education programmes. This requires an open innovation mindset and the capacity to absorb and act upon external knowledge rather than merely communicate internally generated results.

Related Resources

The following selected resources have been developed within CRAFT-IT4SD to help establish or foster learning ecosystems for the Cultural and Creative Sectors and Industries (

Table 7).

Resource	Type	Description
Learning Ecosystems/Hubs report interim for Stakeholder validation	Report	The report details the activities of the CRAFT-IT4SD community and indicates the preparations and the planning, as well as the presentation of learning services and outcomes to be delivered.
Learning ecosystems/Hubs report	Report	The report describes the processes and outcomes of the CRAFT-IT4SD learning community and –ecosystem activities
Playbook of good practices for emerging skills in fashion and related CCSI	Report	
Initiating the CRAFT-IT4SD Learning Ecosystems	Article	The article provides a brief outline of CRAFT-IT4SD's approach to developing learning ecosystems.
CRAFT-IT4SD launches Learning Community on LinkedIn	Article	The article describes the use of the CRAFT-IT4SD LinkedIn learning community to provide content and facilitate discussions.
The CRAFT-IT4SD Ecosystem: From Experimental Learning to Structured Skills Creation	Article	The article illustrates CRAFT-IT4SD's model to transitioning from local experimentation and learning communities to cross-regional collaborations and capacity building.
Skills and Learning Communities across Fashion and related CCSI	Article	The article provides an overview of CRAFT-IT4SD's approach to fostering learning across the CCSI. It outlines its three-legged framework cantered around building a learning community, organizing training workshops, and the development of learning pathways and micro-credentials.
The CRAFT-IT4SD approach to micro-credentials	Article	The article describes micro-credentials as a utilized tool to develop skills and learning communities.
Future Proofing Creativity: Developing Green, Social, and Digital Competencies for the next Generation of Crafts and Creative Industries	Article	The article describes the increasing relevance for lifelong, modular, and collabroative learning models and emerging relevant compentenices for CCSI.

Triple Transition in the Creative Economy: How Up- and Re-Skilling is Shaping Emerging Professions	Article	The article describes how practitioner profiles within the CCSI are rapidly changing and the importance of up- and re-skilling to in that context.
Bridging the Skills Gap: Preparing Artists and Makers for a Sustainable, Inclusive, and Digital Future	Article	The article describes CRAFT-IT4SD's ecosystem approach to support knowledge sharing and learning by doing/ experimenting.
The Role of Green, Social, and Digital Skills in Transforming the Creative and Cultural Sectors	Article	The article discusses different skill categories within the CCSI and the need for systemic interconnectedness.
Empowering the Future: Up- and Re-Skilling in Emerging Crafts and Creative Professions for the Triple Transition	Article	The article describes CRAFT-IT4SD's model for building learning ecosystems to boost the triple transition.
How Receptive are Craftspeople and Designers to Adopting Digital Innovation for Sustainability?	Article	The article presents learning experiences derived from a focus group conducted with students, designers and 3D printing practitioners who collaborated on a fashion collection integrating additive manufacturing technology.
Gamification in Learning: Turning Work into Play	Article	The article discusses gamification as a tool for creating engaging, hands-on learning experiences, using a game developed within CRAFT-IT4SD on fish-skin tanning as an illustrative example.
From Fish to Wonder	Learning Game	This game, developed by OAMK around the process of tanning fish skin, illustrates how gamification can help convey cultural heritage in an engaging, informative, and accessible way.

Table 7: Resources - Learning communities for capacity building

7. Heritage and Innovation as Continuity

Perspective

Innovation is commonly viewed as a process that brings about disruption. It is typically associated with large-scale technological breakthroughs, replacing old systems with new ones, and creating value by breaking with the past. This understanding is rooted in Joseph Schumpeter's influential notion of creative destruction, where economic development advances through cycles of radical innovation that dismantle existing structures to make way for new ones (Schumpeter, 1942). This perspective has, to a large degree, shaped contemporary innovation policy, entrepreneurship, and technological development. Attention and resources are frequently directed towards break-through ideas that promise to become the “next big thing,” generate temporary competitive advantage, and displace existing products, practices, or industries.

While this model captures important dimensions of innovation, it also tends to narrow our understanding of how economies and societies change and adapt. Novelty, disruption, and progress have become closely associated, creating the impression that meaningful innovation must begin with a radical departure from what came before. Yet change rarely results from entirely new beginnings: New technologies and ideas build upon existing ones, new products and business models recombine established ideas, and knowledge advances through cumulative processes of experimentation and refinement. Transformation is therefore often evolutionary rather than revolutionary. However, conventional accounts of innovation continue to privilege moments of invention over the much longer processes of adoption, adaptation, and use through which innovations acquire significance (Edgerton, 2007).

Adopting an evolutionary perspective on innovation reframes it as a process of continuity as much as one of change. Novelty does not emerge independently of the past but through the continuous adaptation, recombination, and reinterpretation of existing knowledge and practices. From this perspective, innovation is not simply about replacing what came before, but about renewing and extending it. Consequently, cultural resources, including inherited knowledge, skills, practices, traditions, and other forms of cultural expression transmitted across generations, become important assets that contribute to innovation and drive transformation. Consistent with this understanding, the European Union defines cultural heritage as "the resources inherited from the past in all forms and aspects," encompassing tangible, intangible, and digital resources that originate through the interaction between people and places over time and are constantly evolving (Council of the European Union, 2014; European Commission, 2021).

Building on this understanding, CRAFT-IT4SD adopts the concept of *living heritage* to emphasise that cultural heritage is not simply a legacy to be preserved, but a dynamic resource that acquires meaning through its continual use, adaptation, and reinterpretation. This understanding is consistent with UNESCO's conception of living heritage under the 2003 Convention for the Safeguarding of the Intangible Cultural Heritage, particularly as articulated in the context of the 2030 Agenda for Sustainable Development (UNESCO, n.d.). UNESCO emphasises that living heritage is continuously recreated by communities and transmitted across generations, making it a source of resilience and an important contributor to sustainable development. CRAFT-IT4SD extends this perspective by conceptualising living heritage as a source of innovation, providing the knowledge, skills, practices, and cultural capabilities from which innovation emerges, while innovation, in turn, continually renews and reshapes heritage.

This perspective challenges conventional understandings that position heritage, culture, and craft as the antithesis of innovation, associating them primarily with preservation, continuity, and tradition rather than with change and transformation. Instead, inherited knowledge, skills, and practices are understood as productive resources that enable experimentation, adaptation, and renewal. Innovation, in this sense, often emerges through engagement with tradition rather than its rejection. This understanding resonates with writers such as Glenn Adamson, who rejects the notion of craft as inherently conservative or nostalgic (Adamson, 2013). Instead, Adamson shows how craft evolves through the continual reinterpretation and refinement of inherited skills, materials, and practices, illustrating that continuity and innovation are not opposing forces but mutually reinforcing processes.

Following this perspective on innovation as continuity and the role of living heritage within it, CRAFT-IT4SD's objective to revisit the past through craft and craftsmanship is not merely a form of collective nostalgia and heritage preservation through making, but a means of reestablishing intergenerational connections and re-embedding individuals and communities in the social and historical continuum, as well as an ambition to explore to what extent living

heritage, both tangible and intangible, can be a catalyst for sustainable innovation. CRAFT-IT4SD thus connects the green transition with societal resilience, leaning on an intergenerational perspective to craft and manufacturing, based on continuation and belonging rather than of disruption. With the revitalisation of craftmanship and the knowledge, practices and techniques related to craft that we especially have witnessed since the Covid-19 pandemic, follows a renewed focus on skills for sustainability and locally sourced nature-based materials. The unstable geopolitical situation we witness today, and the urge to strengthen Europe's competitiveness and sovereignty through reducing independence on non-EU providers for critical digital products, services, and intellectual property r, is instigating a politicised consumer culture with increased awareness of the origin of products. CRAFT-IT4SD highlights in this current political context, the importance of extending the quest for Europe's sovereignty to societal dimensions, revitalising Europe's living heritage and promoting the innovation and sustainability potential of craftsmanship, intangible knowledge and local materials, strengthening local identities and senses of belonging as we move forward to shaping better and resilient futures.

Approach

To explore the dynamic relationship between living heritage and innovation, CRAFT-IT4SD adopts a practice-oriented approach. Rather than treating heritage as a passive object of preservation, the project investigates how inherited cultural resources are mobilised in processes of innovation while simultaneously being renewed, reinterpreted, and transformed through those very processes. The three illustrative cases explore different expressions of this reciprocal relationship, showing how living heritage both serves as a source of innovation and is continually renewed through innovative practice.

Taken together, the cases suggest a practical framework for understanding how living heritage and innovation interact. Rather than viewing heritage as a single, undifferentiated source or resource, the cases show that heritage can become a source of innovation through three areas of application (Figure 13): (1) cultural expressions embodied in objects and designs; (2) inherited knowledge and practices embedded in production-/ creation processes; and (3) communities that sustain and transmit cultural traditions. Across all three pathways, innovation simultaneously draws upon and revitalizes living heritage.

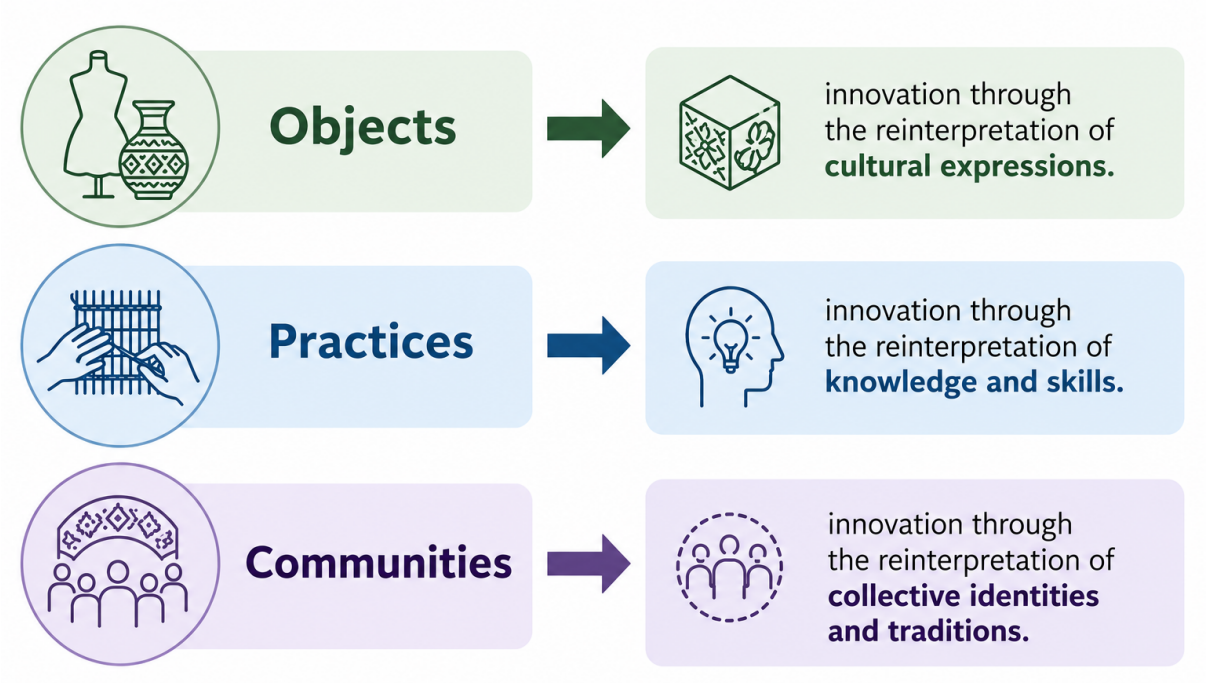

Figure 13: CRAFT-IT4SD Application Areas for Connecting Heritage & Innovation

Beyond providing a practical framework for linking heritage with renewal, CRAFT-IT4SD demonstrates that ethical engagement is not an additional consideration but a prerequisite for working with living heritage. Reinterpreting cultural heritage for contemporary sustainability challenges should not be confused with cultural appropriation. Whereas reinterpretation seeks to create new value while respecting the cultural meanings, rights, and agency of the communities from which heritage originates, cultural appropriation extracts cultural expressions from their social and historical context without meaningful participation, recognition, or reciprocal benefit. Living heritage can therefore support innovation, but only when innovation is grounded in respect, dialogue, and shared value creation (D8.1).

Heritage & Innovation through Objects

The first case focuses on heritage embodied in objects and explores how traditional visual motifs and cultural imagery can be combined with contemporary technologies to create innovative products that connect cultural identity with new forms of design and production. Rather than reproducing traditional artefacts, the approach treats heritage objects as repositories of cultural expressions whose motifs, symbolism, forms, colours, materials, and decorative techniques can be reinterpreted through contemporary design. Innovation therefore emerges through the reinterpretation of cultural expressions rather than their replacement.

The Romanian pilot applied this approach within sustainable fashion design through three successive collections inspired by traditional costumes, Cucuteni pottery, and the symbolic language of Bucovina's decorated Easter eggs. Together, these collections demonstrated how traditional craftsmanship can be combined with digital design and additive manufacturing to translate Romanian folk traditions into contemporary fashion. Rather than replicating historical artefacts, the collections reinterpreted their visual language to create products that connect cultural identity with new forms of production, aesthetic expression, and sustainable innovation.

The process begins by selecting a locally meaningful heritage object or craft tradition. Rather than focusing on the object as a whole, attention is directed towards understanding the cultural expressions it embodies. This involves analysing motifs, ornamentation, colours, materials, production techniques, symbolism, and the cultural narratives associated with the object. The aim is to identify design elements that can be reinterpreted while retaining their cultural significance. In the Romanian pilot, traditional costumes were examined for embroidery patterns, colour combinations, and stitching techniques; Cucuteni pottery for its geometric motifs and symbolic ornamentation; and Bucovina's decorated Easter eggs for their visual language and cultural symbolism. These analyses identified the cultural expressions that could subsequently be reinterpreted in contemporary fashion.

Once the cultural expressions have been identified, they are translated into digital design environments. Traditional motifs are digitised, modelled, and adapted using CAD software and computational design tools, allowing designers to experiment with scale, geometry, and three-dimensional form. This stage is not simply a technical conversion but a creative process of interpretation in which heritage becomes a flexible design language rather than a fixed historical reference. In the Romanian pilot, the identified motifs were digitised and recreated using CAD software, allowing designers to manipulate their geometry, scale, and composition while preserving their recognisable cultural identity. Digital modelling also enabled the integration of traditional patterns into components suitable for additive manufacturing.

Digital models are then explored through iterative experimentation with materials and manufacturing techniques. In the Romanian pilot, extensive testing was undertaken to assess the compatibility of different textiles with additive manufacturing, optimise printing parameters, evaluate post-processing techniques, and refine methods for integrating printed elements into garments. Prototypes were repeatedly evaluated and modified to balance aesthetic quality, technical feasibility, functionality, and cultural authenticity. This iterative process was fundamental to the approach, allowing both technological capabilities and design concepts to evolve together. During the Romanian pilot, iterative prototyping involved repeated experimentation with 3D printing parameters, textile integration, and post-processing techniques. Testing highlighted both the opportunities and limitations of additive manufacturing for fashion, including challenges related to flexibility, softness, washability, and durability. These findings informed successive refinements of both the technological solutions and the design concepts.

Rather than replacing traditional craft, the approach intentionally combines emerging technologies with manual production techniques. Digital fabrication methods, including 3D modelling, additive manufacturing, and digital emboss-

ing, were integrated with hand stitching, manual cutting, leather embossing, and textile assembly. Technology therefore functions as an extension of craftsmanship, enabling new forms of expression while maintaining the value of artisanal knowledge and skills. Throughout the pilot, participants also agreed that digitally produced artefacts should complement rather than replace traditional handcrafted production, preserving its role as a distinct form of cultural practice. In the Romanian pilot, 3D-printed decorative elements were manually integrated into garments through stitching and assembly techniques traditionally used by local artisans, while leather accessories combined digital embossing with hand finishing. Rather than replacing manual work, digital fabrication expanded the possibilities available to craftspeople.

The final stage considers both environmental and cultural sustainability. From an environmental perspective, additive manufacturing supported rapid prototyping, reduced material waste, and enabled experimentation with biodegradable and recycled materials. Equally important, however, was cultural sustainability. The collections demonstrated how traditional visual languages could remain relevant by being continually reinterpreted in contemporary contexts. The resulting garments function not only as fashion products but also as carriers of cultural narratives, connecting traditional craftsmanship with contemporary design and emerging technologies. In the Romanian pilot, the resulting collections were presented through exhibitions and fashion events, including Romanian Fashion Week, providing opportunities to evaluate not only their technical feasibility but also public reception, cultural authenticity, and their ability to communicate Romanian cultural identity in contemporary contexts.

Heritage & Innovation through processes

The second case focuses on heritage embodied in practices and explores how inherited knowledge and production techniques can be reinterpreted to address contemporary sustainability challenges. Rather than treating traditional practices as static forms of knowledge, the approach considers them living resources that can be adapted through experimentation, design, and particular material intelligence. Innovation therefore emerges through the reinterpretation of inherited knowledge and skills rather than through the replacement of traditional practices.

Within this application area, the Danish pilot explored how historical material knowledge could contribute to sustainable textile innovation. Focusing on the protein casein, traditionally derived from milk, the pilot revisited historical recipes and production methods to investigate their potential for developing drapable biomaterials as alternatives to conventional textile materials. Rather than reproducing historical recipes unchanged, the approach combined historical research with contemporary experimentation to adapt traditional knowledge for present-day design challenges. The resulting biomaterials were subsequently explored through clothing design experiments, demonstrating how inherited material practices can be renewed through contemporary design and sustainability-oriented innovation.

The process begins by researching relevant craft practice, production technique, or material tradition that addresses a contemporary challenge, such as findings ways to produce more sustainable materials. Rather than focusing solely on physical artefacts, attention is directed towards the knowledge, skills, and processes embodied in traditional practice. In the Danish pilot, this involved selecting historical casein-based material production as a source of inspiration for sustainable textile development. The selected practice is examined through historical and documentary research to understand its materials, recipes, production methods, and cultural context (Figure 14). The objective is to identify transferable knowledge that can inform contemporary experimentation while recognising that historical practices may require adaptation rather than direct reproduction. In the Danish pilot, historical uses of casein were investigated before traditional recipes were transferred into an experimental setting.

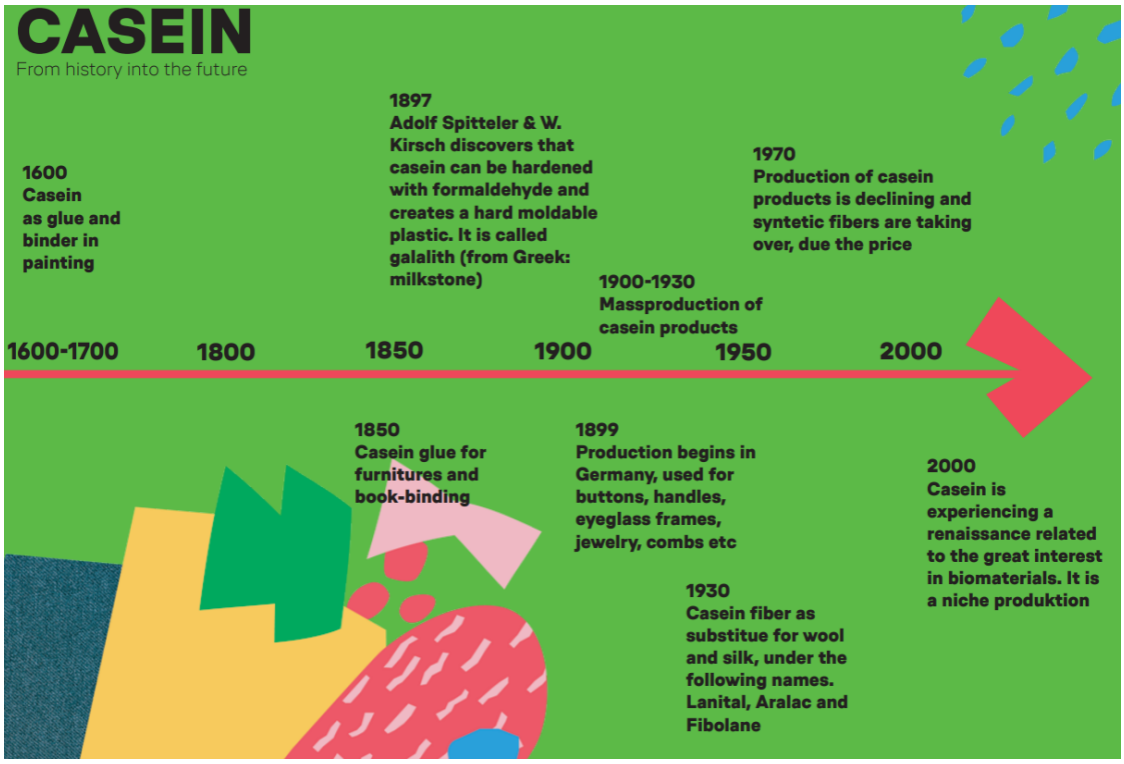

Figure 14: History of Casein use (Source: VIA)

Historical recipes and techniques are then recreated and adapted through iterative experimentation. Rather than seeking to reproduce historical outcomes exactly, experimentation explores how inherited knowledge can be modified to meet contemporary functional, aesthetic, and sustainability requirements. In the Danish pilot, traditional casein recipes were tested and refined to develop drapable biomaterials suitable for textile and fashion applications, enabling a material-driven design approach. The developed materials are evaluated through practical design experiments to assess their performance, usability, and creative potential. Rather than remaining laboratory samples, the materials become part of an iterative design process in which their properties are explored through research and user-centric development. In the Danish pilot, the developed casein materials were employed in shape experiments from a clothing design perspective to investigate their suitability for contemporary fashion.

The final stage considers both the environmental contribution of the developed materials and the broader value of renewing traditional knowledge. The approach demonstrates how historical practices can contribute to contemporary sustainability transitions by generating new material alternatives while simultaneously preserving and extending traditional knowledge. In this way, innovation not only draws upon inherited practices but also contributes to their continued evolution as living heritage.

Heritage & Innovation through Communities

The third case focuses on heritage embodied in communities and explores how collective identities, cultural relationships, and shared ways of knowing can become sources of innovation. Rather than viewing communities solely as custodians of culture and heritage, the approach recognises them as active co-creators of living heritage whose collective knowledge, values, and cultural practices continually evolve through participation, dialogue, and shared experience. Innovation therefore emerges through the reinterpretation of collective identities and traditions rather than through the preservation of fixed cultural forms.

Within this application area, the Finnish pilot explored how Indigenous knowledge systems, participatory artistic practice, and collective future imagining could contribute to sustainability-oriented innovation within the CCSI. Centered on artistic performances and accompanying future dreaming workshops, the pilot combined artistic expression with facilitated participation to create spaces in which participants collectively explored regenerative futures grounded in ecological balance and collective wellbeing. Rather than producing material artefacts or technological prototypes,

the pilot demonstrated how community-based cultural processes themselves can become vehicles for innovation and future visioning, generating new forms of insight, collaboration, and sustainability-oriented practice.

The process begins by identifying communities whose cultural traditions, knowledge systems, and lived experiences provide the foundation for collaborative innovation. Rather than focusing on individual expertise, attention is directed towards the collective knowledge, values, narratives, and relationships embedded within communities. In the Finnish pilot, this centred on Sámi knowledge systems, storytelling traditions, joik, and decolonial perspectives. Innovation and transformation potentials are collaboratively explored with community members to ensure that methods, spaces, and facilitation reflect local cultural values and ethical principles. In the Finnish pilot, the *Girjái* performances and future dreaming workshops were adapted through co-design sessions involving the artistic team and pilot partners, ensuring that the performative, participatory, and spatial elements formed a coherent and culturally appropriate whole.

The core of the approach involves participatory activities that enable communities to collectively (re-)interpret cultural aspects and heritage in relation to contemporary challenges and future possibilities. In the Finnish pilot, performances were followed by facilitated future dreaming workshops in which participants imagined a decolonial future through storytelling, guided writing, group discussions, and collective reflection. These activities positioned imagination itself as a resource for sustainability-oriented innovation. Throughout the process, participants contribute as co-creators rather than passive audiences. Multilingual facilitation, inclusive participation, and respect for Indigenous knowledge systems support the co-production of knowledge while strengthening relationships between artists, communities, students, cultural practitioners, and other stakeholders. Continuous reflection and adaptive facilitation enable learning throughout the process while ensuring that community values remain central. Particular attention was given to cultural continuity, community wellbeing, skills development, network building, and the contribution of participatory artistic practice to sustainability and the green transition. Ethical considerations—including confidentiality, accessibility, intellectual property, and the respectful treatment of Indigenous knowledge—formed an integral part of shaping and evaluating the success of the pilot.

Transferable Development Outcomes

Although the described case activities address different dimensions of living heritage, they demonstrate pathways through which living heritage can be mobilised as a source of innovation. Across the three application areas, the pilots show how innovation can emerge through the reinterpretation of different forms of inherited cultural resources. In the Objects application area, innovation was generated by translating the cultural expressions embodied in heritage objects into contemporary products through design, digital technologies, and iterative prototyping. In the Practices application area, innovation emerged by adopting and expanding upon inherited techniques knowledge through research, experimentation, and application. In the Communities application area, innovation was fostered through participatory and community-based processes that combined Indigenous knowledge and perspectives, artistic practice, and collective imagination to co-explore visions for new, sustainability-oriented futures.

From a replication perspective, the three cases demonstrate how both tangible and intangible forms of cultural heritage can be understood not as remnants of the past that constrain progress, but as living resources capable of informing innovation and sustainability transformations. As with the other development strands presented in this report, it is important to distinguish between the specific activities undertaken within CRAFT-IT4SD and the broader principles that can be transferred to other contexts.

The intention is not to replicate specific heritage assets, artistic practices, or technological solutions developed by the project partners. Cultural heritage is inherently place-based and derives its value from the identities, histories, and communities in which it is embedded. Attempting to standardise or prescribe how heritage should be used for innovation risks undermining the very diversity and authenticity that make it a valuable resource.

Instead, the transferable element lies in the underlying methodologies. Regions can draw upon their own locally significant objects, craft practices, knowledge systems, communities, and technological capabilities while following the same general principles: identifying forms of living heritage with innovation potential, analysing the cultural resources they embody, reinterpreting them through contemporary design, experimentation, or participatory pro-

cesses, and evaluating outcomes from cultural, social, environmental, and innovation perspectives. In this way, innovation becomes rooted in regional identity rather than detached from it, enabling regions to develop context-specific solutions that simultaneously strengthen cultural continuity and support sustainability transitions.

Beyond that, we posit that adopting a heritage and innovation as continuity lens as described in this chapter has broader implications for regional innovation ecosystems and sustainability transitions:

- **Revealing innovation potential in living heritage:** Applying a heritage lens can expand the range of resources for innovation. Rather than focusing exclusively on new technologies or marketing opportunities, it encourages innovators to recognise the latent innovation potential embedded in existing cultural resources. These resources may take the form of tangible heritage objects, inherited knowledge and skills, or community-based traditions and ways of knowing that would otherwise remain outside conventional innovation processes. Such resources can contribute to different stages of innovation. As demonstrated by the CRAFT-IT4SD pilot activities, heritage communities can be engaged during the early, exploratory stages of innovation to co-create more inclusive understandings of sustainability challenges and identify alternative future possibilities; Cultural expressions embodied in heritage objects can inform the design of products that strengthen emotional attachment, cultural identity, and product longevity; Traditional practices and historical knowledge can provide proven starting points for developing more sustainable materials, production methods, and technologies that are subsequently adapted to contemporary needs. In each case, heritage functions not as a constraint on innovation but as an additional resource that broadens the range of possible solutions.

  More fundamentally, this perspective reflects an understanding of innovation as an evolutionary rather than purely disruptive process. Instead of assuming that sustainable innovation always requires entirely new solutions, it recognises that transformation can also emerge through the continuous reinterpretation and adaptation of existing cultural resources. Incremental changes grounded in local knowledge and traditions may accumulate over time to produce significant societal and environmental impacts.

- **Strengthening regional identity and cultural cohesion.** A heritage-informed perspective can strengthen regional innovation ecosystems by rooting innovation in the identities and values of the communities they serve. Rather than treating innovation as the adoption/adaption of externally developed technologies or business models, the heritage–innovation nexus encourages regions to begin with their own cultural assets, knowledge systems, and aspirations. In doing so, innovation becomes not something that happens *to* communities, but something that develops *from within* them.

  This shift has important implications for both innovation and regional development. When innovation draws upon locally meaningful heritage, it reflects the distinctive cultural characteristics of a region or ecosystem and is more likely to resonate with those who are expected to adopt, develop, or benefit from it. The three pilots illustrate this in different ways. The Romanian case reinterpreted culturally significant motifs and objects to create contemporary products that retained strong connections to regional identity. The Danish case demonstrated how inherited material knowledge and traditional practices could be adapted to contemporary sustainability challenges. The Finnish case showed how participatory engagement with Indigenous knowledge systems and collective imagination could generate new perspectives on sustainable futures while strengthening relationships between communities, artists, and other regional actors.

  By connecting innovation to shared cultural identities and locally meaningful aspirations, a heritage lens can strengthen the social foundations of regional innovation ecosystems. Heritage therefore functions not only as a source of ideas and knowledge, but also as a source of trust, belonging, and collaboration. This creates conditions in which innovation may be more likely perceived as authentic, collectively owned, and aligned with the values and long-term ambitions of the communities involved.

- **Supporting sustainability through continuity rather than replacement.** Sustainability transformations need not always begin with entirely novel technologies or solutions. Applying a heritage lens could encourages regions to view living heritage as a repository of accumulated knowledge, practices, and technologies that have evolved through long-term interaction between communities and their environments. Rather than assuming that progress requires replacing the existing, the heritage–innovation nexus invites innovators to

ask what valuable capabilities already exist and how they might be reinterpreted to address contemporary sustainability challenges.

The Danish pilot illustrates this particularly well. By revisiting historical casein-based recipes and creation practices, the project did not seek to recreate the past but to investigate whether traditional material knowledge could provide new pathways towards more sustainable textile production. Historical practices thus became a starting point for experimentation rather than an endpoint to be replicated unchanged. Similar principles can be applied across many sustainability domains, where inherited knowledge and practices may reveal overlooked alternatives to resource-intensive materials, production processes, or patterns of consumption.

More broadly, this perspective challenges the assumption that innovation is synonymous with replacement. Many traditional practices became less prominent not necessarily because they lacked technical or environmental merit, but because they were displaced by changing economic conditions, industrial production systems, or shifting societal priorities. Revisiting these practices through contemporary scientific knowledge, design methods, and technological capabilities can therefore uncover solutions that remain highly relevant today.

Seen from this perspective, sustainability transitions become processes of continuity as much as transformation. Rather than abandoning the past in pursuit of entirely new futures, regions can build upon existing cultural capabilities, adapting and renewing them to meet contemporary environmental and societal challenges. Living heritage thus becomes not only a record of past ways of living, but also a source of practical knowledge that can inform more sustainable futures.

Taken together, the three application areas described demonstrate that living heritage is not simply preserved through invention and innovation but continually renewed by it. By reinterpreting cultural expressions, inherited knowledge and skills, and collective identities and traditions in an ethical responsible way culture can instigate novation while hich living heritage remains relevant, adaptive, and capable of contributing to contemporary sustainability challenges (D8.1 Ethics).

Key Insights for Replication

Although focused on different application areas, the three cases reveal a generalisable pattern that provides a flexible framework for replication. While the specific forms of living heritage, methods, and outcomes differed, each pilot followed a similar process through which living heritage informed and shaped contemporary sustainability-oriented innovation. Rather than prescribing particular methods or heritage elements, this pattern provides a transferable process that can be adapted to different cultural contexts.:

1. **Identify forms of living heritage in close collaboration with local communities and actors.** It begins by identifying forms of living heritage that are relevant to the regional context and/or to the challenge or opportunity being addressed. The three application areas described earlier in this chapter provide a useful orientation for this process. Depending on the context, this may include tangible heritage objects or designs, traditional knowledge and practices, or communities and cultural identities.
2. **Understand what living heritage can contribute.** Once applicable forms of heritage have been identified, the next step is to explore what knowledge, meanings, skills, values, or perspectives they embody that may contribute to addressing the challenge. This may involve historical research, dialogue with heritage communities, documentation of practices, or analysis of cultural expressions. The objective is not to extract heritage for innovation, but to develop an informed understanding of how living heritage can meaningfully guide contemporary sustainability-oriented innovation.
3. **Reinterpret and experiment.** Innovation, understood as both transformation and continuity, involves collaboratively reinterpreting living heritage for contemporary contexts through iterative experimentation and development. Such reinterpretation should take place in close dialogue with the relevant communities and be guided by principles of inclusivity, ethical responsibility, and respect for cultural meanings, boundaries, and potential tensions. Depending on the context, this may involve contemporary product design, material experimentation, artistic practice, participatory methods, or other activities. Throughout this process, tradi-

tional knowledge, cultural expressions, and community perspectives are responsibly combined with contemporary technologies, design approaches, and creative methods to explore new products, materials, services, experiences, or collaborative practices. Reinterpretation and experimentation evolve together, with each iteration generating new insights that inform further refinement.

4. **Evaluate and refine outcomes.** Heritage-informed sustainable pathways and innovation should be evaluated not only in terms of technical feasibility or economic performance, but also with regard to its broader cultural, social, and environmental impact consequences. Because innovation actively reinterprets and influences living heritage, practitioners should carefully assess how interventions affect the communities, cultural expressions, and identities from which they draw (D8.1). This includes evaluating whether innovation represents a respectful reinterpretation of heritage that creates shared value, or whether it risks cultural appropriation, misrepresentation, or the extraction of cultural knowledge without meaningful participation, recognition, or reciprocal benefits for the communities concerned. Particular attention should therefore be paid to cultural representation, intellectual property, benefit sharing, and the long-term vitality of living heritage alongside sustainability objectives. This broader evaluation recognises that heritage is both a source for innovation and something that is itself transformed through the innovation process.

Importantly, the individual methods employed within each step are not intended to be replicated directly. The heritage, the actors involved, and the technologies applied will inevitably differ between regions. What is transferable is the underlying logic: beginning with locally meaningful heritage, uncovering the innovation potential it contains, reinterpreting it for contemporary contexts, experimenting with new applications, and evaluating outcomes from multiple perspectives. This pattern enables ecosystems to drive transformations that are simultaneously rooted in their own identities and responsive to contemporary sustainability challenges.

Beyond providing a framework for connecting heritage and innovation, one of the most important lessons emerging from CRAFT-IT4SD is that working with living heritage requires a fundamentally different ethical perspective from many conventional innovation processes. Although living heritage can serve as a valuable source or inspiration for innovation, is inclusion is not without responsibilities. Unlike many innovation resources, living heritage remains embedded within communities, identities, cultural values, and ongoing social practices. Working with living heritage therefore requires responsible engagement with the people and traditions from which it originates (see D4.1 - Playbook 01 - CCSI for sustainability 01 - updated).

The Romanian and Finnish pilots illustrate this principle in different ways. In Romania, the reinterpretation of traditional motifs and craftsmanship required careful consideration of authenticity, cultural representation, intellectual property, and fair benefit sharing with artisans, custodians, and communities. In Finland, engagement with Sámi traditions demonstrated that common innovation concepts themselves may need to be adapted to respect Indigenous values and ways of living, rather than expecting heritage to conform to externally defined innovation objectives. The lessons from the Finnish pilot are closely aligned with established principles for Indigenous engagement, such as the CARE Principles for Indigenous Data Governance, which emphasise collective benefit, community authority, responsibility, and ethics (GIDA, n.d.). Although developed for data governance, these principles provide useful guidance for innovation processes involving Indigenous knowledge and living heritage. Together, these experiences show that replication should be guided by principles of respect, participation, reciprocity, and shared value creation.

Related Resources

Resource	Type	Description
D4.1 Playbook CCSI for sustainability	Report	The report provides detailed descriptions of the activities and approaches planned for the CRAFT-IT4SD pilots, including the role of heritage and an ethics framework.
D4.2 Initial Report of the Pilots	Report	Detailed description of the first pilot iteration, including objectives, methods, participants, and findings.
D4.3 Interim Report of the Pilots	Report	Detailed description of the second pilot iteration, including objectives, methods, participants, and findings.
D4.5 Final Report of the Pilots	Report	Detailed description of the third pilot iteration, including objectives, methods, participants, and findings.
D2.2 Method Playbook (Final)	Report	Final Playbook and the CRAFT-IT4SD methodology, including insights on the role and nature of heritage and craft.
D8.1 Ethics Requirements	Report	This deliverable outlines CRAFT-IT4SD's ethical approach and guidelines
Traditional Mask-Insipired Sustianable Fashion Collection	Article	The article outlines the development process of a fashion collection combining aspects of cultural heritage, novel technologies, and sustainability.
Cultural Heritage as a Pathway to Developing Future Materials for Garments. Trial-And-Error in Material Experimentations.	Article	The article explores cultural heritage as a foundation for contemporary material innovation. It presents two cases: the use of casein at the Danish pilot site (VIA University College) and the use of fish skin at the Finnish pilot site (Oulu University of Applied Sciences), illustrating how trial-and-error experimentation can transform traditional knowledge into new material applications.
Where Heritage Meets Innovation: CRAFT-IT4SD Pilots Crafting a Circular and Sustainable Future	Article	This article provides an overview of CRAFT-IT4SD´s second iteration pilot activities, including those focused on legislation.
Reimagining Cultural Heritage Through Sustainable Approaches Using 3D Printing Technologies	Article	Features and principles behind combining heritage and technology in fashion
Reviving Authentic Crafts with Additive Manufacturing	Article	On the use of additive manufacturing to revitalize heritage.

Table 8: Heritage and Innovation as Continuity Strand

8. Key Development Factors

Beyond the CRAFT-IT4SD development strands, several factors were identified and discussed that play an important role in shaping CCSI ecosystems. These factors are significant because, depending on how they are addressed and managed by ecosystem actors, they can either enable or constrain the emergence of resilient, sustainable, and mutually beneficial forms of ecosystem development. Rather than being inherently positive or negative, their impact depends on the decisions, priorities, and governance arrangements that guide ecosystem evolution.

To facilitate application and replication in other contexts, the identified factors were organized into four dimensions: **Technological**, **Commercial**, **Ecological**, and **Societal**. This structure provides a practical framework for considering ecosystem strengths, vulnerabilities, and development priorities, while encouraging a more holistic understanding of the mechanisms that shape CCSI. As these factors are often interconnected, efforts to strengthen one aspect of ecosystem development may generate unintended effects on others. Maintaining a holistic perspective and actively considering such trade-offs is therefore essential for fostering a balanced and resilient development trajectory.

Advancing Technology Integration

Technology is evolving rapidly and offers significant potential for innovation, sustainability, and resilience. At the same time, the full implications of emerging technologies are often uncertain, and their adoption can have profound effects on existing practices, business models, skills, and cultural traditions. As a result, hesitation or resistance towards new technologies may be both understandable and justified.

Yet technology also has the potential to generate substantial benefits for the sector, including new forms of value creation and reduced environmental impacts. Realizing these benefits depends not only on the technologies themselves, but on how they are introduced and integrated into the ecosystem. Technology adoption should therefore be approached as an open, participatory, and experimental process in which stakeholders have opportunities to explore, test, evaluate, and collectively shape the role of technology within the sector.

From this perspective, technology represents an opportunity when access to relevant solutions is broad, experimentation is encouraged, and outcomes are transparent and openly discussed. Such conditions help foster trust, learning, and informed decision-making, ensuring that technology complements and strengthens craftsmanship, creativity, cultural heritage, and human expertise rather than displacing or undermining them. The challenge is therefore not whether technology should be adopted, but how it can be governed and deployed in ways that support the long-term resilience, sustainability, and distinctiveness of the ecosystem.

Table 9: Key Factors influencing Technological Development within CCSI Ecosystems

Key factor	Risks and Barriers	Enablers and Opportunities
Technology–heritage compatibility	Technology replaces heritage practices Loss of authenticity	Technology complements heritage practices Enhanced relevance and visibility
Stakeholder attitude	Resistance to change	Openness to experimentation and learning
Inclusivity	Missing access or financial resources (SMEs)	Open access enables broader participation
Usability	Technologies are imposed and misaligned with real needs	Craft practices guide technology development
Control	Unclear ownership, appropriation risks, concentration of control	Transparent governance and use of data
Impact visibility	Difficulty measuring or communicating benefits slows adoption	Uptake and scaling through evidence

Aligning Business Models with Sustainable Value Creation

Economic viability and innovation are essential for the long-term prospects of CCSI ecosystems. However, promoting sustainable development is not simply a question of increasing productivity, but of aligning economic activity with broader cultural, social, and environmental objectives.

Achieving such alignment is rarely straightforward. Different objectives may compete or create tensions, while established business models and value chains have often become highly complex, globalized, and difficult to transform. At the same time, the viability of more sustainability-oriented business models remains uncertain and depends on a range of factors, many of which lie beyond the control of individual organizations. Experimenting with and implementing alternative approaches also requires resources, capabilities, and risk tolerance that may be scarce, particularly among smaller actors.

Nevertheless, innovative business models represent one of the most promising avenues for addressing environmental and societal challenges. Shifting from models based on volume, overproduction, and rapid consumption towards approaches centered on durability, repair, reuse, quality, and long-term value creation can contribute to both sustainability and resilience. Importantly, many such practices are not entirely new. Historically, repair, longevity, local production, and resource efficiency were common features of economic activity. As such, traditional knowledge, cultural heritage, and craft-based practices can provide valuable inspiration for developing more sustainable forms of business and consumption.

From this perspective, creating space for experimentation with alternative forms of value creation becomes a critical enabling factor. Bringing together traditional materials, skills, and production methods with innovative approaches to business, technologies, and collaboration can help identify viable pathways that balance economic performance with environmental sustainability and social value. The key challenge is not only to innovate sustainably, but to do so in ways that ensure the long-term resilience and economic viability of CCSI ecosystems.

Key factor	Risks and Barriers	Enablers and Opportunities
Redefining value & growth	• Reliance on traditional growth models limits sustainable innovation	• Adoption of alternative value understandings (e.g. sufficiency, longevity) enables new models • Heritage as inspiration for sustainable development
Viability	• Lack of proof of concept • Unclear economic viability	• Uptake through demonstrated success cases
Scaling	• Volume-based scaling undermines sustainability	• Alternative scaling approaches (networks, replication, local models)
System thinking	• Fragmented understanding of value chains limits innovation	• Holistic/system thinking enables integrated, circular models
Digital business models	• Lack of knowledge or sub-optimal digital adoption	• Digitalization as enabler of new markets, efficiencies, and models • Experimentation and adoption via shared knowledge and guidance
Networks & new actors	• Weak collaboration • Limited newcomers	• Strong networks and new generations drive renewal and innovation

Table 10: Key Factors influencing Sustainable Business Development within CCSI Ecosystems

Embedding Ecological Responsibility in CCSI Ecosystems

Ecological sustainability cannot be achieved solely through the actions of individual organizations. Even the most innovative business models remain constrained by the regulatory environments, resource systems, market incentives, infrastructures, and collaborative networks in which they operate. Moreover, sustainability transitions unfold at the ecosystem level, where the actions of individual actors are interconnected and their impacts extend beyond organisational boundaries. Consequently, embedding ecological responsibility within CCSI ecosystems requires attention not only to how value is created, but also to the institutional, cultural, and systemic conditions that influence environmental outcomes. Policies, governance mechanisms, sustainability knowledge, ecosystem collaboration, and circular resource flows all play a critical role in determining whether sustainable practices can emerge, scale, and endure.

A key enabling factor is the existence of shared frameworks and guiding principles centered on circularity, regeneration, and long-term sustainability. Such frameworks provide a common direction for ecosystem actors, helping to align expectations, coordinate actions, and establish shared standards of responsibility and accountability. By creating common regulation and understanding of desired outcomes, they can reduce uncertainty and support more coherent and collective approaches to sustainability challenges.

However, for such frameworks to be effective, they must be both ambitious and practical. Sustainability requirements should be grounded in the realities of the sector and designed in ways that enable broad participation rather than placing disproportionate burdens on actors with limited resources and capacities. Effective frameworks therefore combine clear goals, principles, and governance structures with sufficient flexibility to allow for decentralized, bottom-up, and context-specific implementation.

Moreover, ecological responsibility depends on strong communities and collaborative ecosystems capable of continuous learning and adaptation. The ability to share knowledge, resources, experiences, and good practices enables actors to respond more effectively to emerging challenges and opportunities. In this sense, sustainability becomes not only an individual responsibility, but a collective capability that is developed and maintained across the ecosystem as a whole.

Table 11: Key Factors influencing Ecological Responsibility within CCSI Ecosystems

Key factor	Risks and Barriers	Enablers and Opportunities
Policy & regulation	• Weak, unclear, or poorly implemented policies hinder transition	• Supportive and well-applied policies accelerate change
Governance & responsibility	• Unclear roles create inaction and fragmentation	• Clear responsibilities enable coordinated action
Local regional governance	• Centralized or weak local structures limit adaptation	• Strong local governance enables context-specific solutions
Sustainability knowledge & risk perception	• Lack of knowledge and perceived risks slow adoption	• Awareness and capacity-building unlock action
Circularity scope	• Narrow focus on circularity limits systemic impact	• Broader regenerative approaches enable long-term sustainability
Clusters & ecosystems	• Weak collaboration slows innovation and scaling	• Cluster-based approaches enable shared resources and faster transition

Embedding Social Responsibility in CCSI Ecosystems

Advancements along technological, economic, and environmental dimensions are essential for the long-term development of CCSI ecosystems. However, such progress should not come at the expense of individual wellbeing, social

cohesion, democratic participation, or community resilience. Social sustainability is often overlooked in transformation processes and only receives attention once adverse consequences become visible. Yet the social implications of technological innovation, new business models, and sustainability transitions should be considered from the outset rather than treated as an afterthought.

This challenge is well illustrated by economic Nobel prize winners Daron Acemoglu and Simon Johnson in their work *Power and Progress* (2023). The authors demonstrate how technological advances have historically generated significant benefits, but have often initially concentrated wealth, influence, and decision-making power among a relatively small number of actors. The subsequent challenge has frequently been to ensure that the benefits of innovation are distributed more broadly across society, and that technological change strengthens rather than undermines democratic institutions and social wellbeing.

Such outcomes are not inevitable. By explicitly considering social impacts during the design and implementation of innovation and transformation processes, ecosystem actors can help ensure that technological, economic, and environmental progress contributes to inclusive and equitable development. Central to this is the existence of strong communities and participatory governance structures that enable informed and meaningful engagement in decision-making processes. Healthy ecosystems create space for diverse perspectives and interests to coexist, allowing both more conservative and more transformative visions of development to be debated and reconciled.

Equally important is the recognition of cultural diversity as a source of creativity, resilience, and innovation. Diverse cultural traditions, practices, and ways of knowing can enrich ecosystem development and expand the range of possible solutions to shared challenges. Finally, attention must be paid to possible dependencies within ecosystems. Concentrations of power, excessive reliance on, for example, individual technology providers, or asymmetric relationships can undermine resilience and limit the capacity of local communities and organizations to shape their own futures. Embedding social sustainability therefore requires not only fostering participation and inclusion, but also ensuring that power, opportunities, and benefits are distributed in ways that strengthen the long-term resilience and autonomy of the ecosystem.

Table 12: Key Factors influencing Social Responsibility within CCSI Ecosystems

Key factor	Risks and Barriers	Enablers and Opportunities
Community strength	• Fragmentation and low ownership due to weak local engagement and actor tie, undermining collaboration, access to resources, local strategizing and incentive structures that support cohesion	• Resilience and shared value due to strong community anchoring
Preservation-innovation-balance	• Overemphasis on preservation prevents evolution	• Balanced approach keeps heritage dynamic and relevant
Ownership & access	• Exclusive ownership limits participation and benefits	• Inclusive or shared models enable wider engagement
Cultural differences	• Ignoring social norm differences hinder collaboration	• Inclusivity and exchange through respectful and ethical engagement
Knowledge sharing	• Lack of platforms limits diffusion of practices	• Active sharing accelerates peer learning and replication
Role of SMEs and micro actors	• Under-support limits their societal contribution	• Empowered small actors drive local development and cohesion

9. The CRAFT-IT4SD Replication Pathway: An Ecosystem as a Service

CRAFT-IT4SD goes beyond traditional sectoral boundaries by connecting living heritage, craft, design, digital technologies, sustainability, immersive storytelling, and new business models. This holistic approach allows different actors to co-create solutions that proactively respond to the challenges of the green transition while strengthening local identities, creative knowledge, and cultural heritage.

Inspired by the principles of the New European Bauhaus and informed by wider European innovation frameworks, CRAFT-IT4SD seeks to generate tangible results, methodologies, and learnings that can be transferred to other Cultural and Creative ecosystems across Europe. In this sense, the project is not only a research and innovation initiative, but also a platform for ecosystem transformation, supporting the cultural and creative sectors in becoming active contributors to a more sustainable, inclusive, and future-oriented economy.

Accordingly, the CRAFT-IT4SD replication approach is based on a structured but flexible logic. It brings together evidence-based analysis, stakeholder engagement, sustainability reflection, and practical experimentation. Rather than treating sustainability as an additional element to be added at the end of a creative or business process, the CRAFT-IT4SD methodology places sustainability at the beginning: as a starting point for imagining new forms of value creation, production, consumption, and collaboration.

At the same time, the process recognizes that each ecosystem is different. Local cultural heritage, creative traditions, institutional frameworks, business structures, technological capacities, consumer behaviours, and sustainability priorities vary from one territory to another. For this reason, CRAFT-IT4SD's replication is as stated understood as a process of adaptation, learning, and co-creation. Each ecosystem will be encouraged to interpret the methodology in its own way and to develop responses that are meaningful and feasible within its specific context.

In this sense, CRAFT-IT4SD's replication approach offers a practical framework for collective learning. It connects and supports ecosystems in making their assumptions visible, linking diverse perspectives, identifying opportunities and barriers, and exploring how cultural heritage, craft knowledge, digital innovation, and sustainability can work together to generate impact.

Ultimately, the Replication Process seeks to build a wider European community of connected creative ecosystems committed to sustainable transformation. By sharing the CRAFT-IT4SD methodology and know-how, the project aims to inspire other territories to develop their own pathways towards greener, more circular, and more culturally grounded creative economies.

To facilitate this, CRAFT-IT4SD puts forward a **Replication Pathway,** for which D4.4 lays the foundation through strand analysis and resource-selection; this will be followed by an operational and interactive playbook-version to guide interested ecosystem actors through the approaches and principles applied within CRAFT-IT4SD.

The CRAFT-IT4SD Replication Pathway also entails a **self-assessment tool**, designed to help each ecosystem understand its current position, strengths, needs, and readiness for replication. This first step will provide a common starting point and help each territory identify which parts of the CRAFT-IT4SD methodology are most relevant for its own development.

Finally, the Replication Pathway will be complemented by a **digital resource platform**, conceived as a repository of the project materials, tools, methods, examples, and resources, which have been reported in D4.4. This platform will allow ecosystems to access the necessary information to support their own replication journey, including practical guidance, methodological resources, and selected outputs generated throughout the project.

The CRAFT-IT4SD Meta-Ecosystem

Becoming part of the CRAFT-IT4SD Replication means joining a wider European community of Cultural and Creative ecosystems interested in craft, sustainability, digital innovation, circularity, and future-oriented creative practices.

This Meta-Ecosystem is conceived as an **ecosystem of ecosystems**: a connected network of territories, organizations, initiatives, and key actors that wish to explore how the CRAFT-IT4SD methodology and know-how can be adapted and activated in their own contexts. It offers an opportunity to be part of a shared European movement working towards more sustainable, fair, and culturally grounded creative economies.

Participation in the CRAFT-IT4SD Replication Meta-Ecosystem will offer several benefits:

- **Visibility at European level:** Participating ecosystems will be included in a dedicated map of engaged ecosystems, showcasing the emerging CRAFT-IT4SD Meta-Ecosystem across Europe. This map will help make visible the territories, organizations, and creative communities that are interested in advancing sustainability-driven innovation through craft, cultural heritage, digital tools, and new business models.
- **Connection with other creative ecosystems:** Being part of the Meta-Ecosystem will allow participants to connect with other European actors facing similar challenges and opportunities. It will create a space for exchange, inspiration, and potential collaboration among ecosystems working on the green transition of the Cultural and Creative Sectors and Industries.
- **Access to the CRAFT-IT4SD Replication Pathway and resources:** Participating ecosystems will be invited to engage with the CRAFT-IT4SD Replication Pathway, including the self-assessment tool, the interactive playbook, and the digital resource platform. These resources will support each ecosystem in identifying its own starting point, exploring relevant strands of the methodology, and adapting the project's learnings to its local reality.
- **Opportunity to be part of the CRAFT-IT4SD Exhibition – "Crafting Futures":** Selected ecosystems may have the opportunity to be connected to the CRAFT-IT4SD Exhibition, **"Crafting Futures"**, taking place in Oulu, Finland, from **27 to 29 October 2026**. The exhibition will represent a key moment for the project and will offer a European platform to showcase practices, approaches, and visions linked to craft, sustainability, innovation, and digital transformation.
- **Recognition through the CRAFT-IT4SD Seal:** Ecosystems engaging with the replication process will be part of the Meta-Ecosystem through a **Seal of Recognition**, acknowledging their participation and commitment to exploring the CRAFT-IT4SD methodology. The seal will act as a visible sign of connection with the project and with a broader European community committed to sustainable creative transformation.
- **Positioning within a future-oriented European initiative:** Joining the Meta-Ecosystem allows participating organizations and territories to position themselves within an emerging European framework that connects living heritage, material intelligence, green legislation, ethical approaches, learning communities, open platforms, and circular business models. It is an opportunity to be associated with a forward-looking initiative that understands the Cultural and Creative Sectors and Industries as active contributors to the green transition.

Ultimately, the CRAFT-IT4SD Replication Meta-Ecosystem is not only a dissemination mechanism, but a space for recognition, visibility, learning, and connection. It invites creative ecosystems across Europe to become part of a shared process of experimentation and adaptation, contributing their own knowledge while benefiting from the collective experience generated through CRAFT-IT4SD.

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