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CRAFTS AND EMERGING TECHNOLOGIES

From tradition to innovation by integrating 3D printing and sustainable craft development

An Article by Reginnova NE

From Tradition to Innovation by Integrating 3D Printing and Sustainable Craft Development

Integrate 3D Printing technologies in TCLF sectors using Expert Advice

Introduction

The TCLF industries are a pillar of the European economy, and crucial from a strategic as well as from a cultural standpoint, with over 2,2 million workers employed across Europe in TCLF industries and over 5 million people employed in the broader fashion value chain according to a recent report by the EC and a turnover of over EUR200 bn. While innovative practices, high-value products and services and new business models helped European companies to maintain their global competitiveness, challenges persist in the sectors. (EC: Data on the EU textile ecosystem and its competitiveness).

The global marketplace is extremely competitive and fast-changing. European TCLF businesses, many of which are SMEs, face intense pressure from low-cost producers abroad, shifting consumer demands, and emerging technologies. Challenges such as trade liberalization, rising external competition, changing consumer preferences, and technological advances, coupled with environmental and social pressures, mean that European companies “must continuously reinvent their business models.” (EC Fashion and High-end industries in the EU). Given the still significant impact the industry has on the climate, the new environmental policies and the slowing of innovation signals such as patents and design registrations, it is now more imperative than ever for European companies to push the envelope. This includes embracing new tools, materials and processes that boost competitiveness while still preserving the unique aspects and knowledge of the TCLF sectors.

Beyond numbers, Europe’s fashion and craft industries are a significant vibrant part of its intangible cultural heritage, building upon centuries of artisanal knowledge as true “ambassadors of European values such as culture, creativity, innovation and craftsmanship”.

In other words, Europe’s TCLF sectors do not only produce goods. They embody tradition, regional identity, and creative expertise passed down through generations and connect with broader cultural and creative sectors to provide further value using creativity and digital innovation, thus playing a key role in the transition towards more sustainable and socially responsible economies. (Ortiz-Ospino et al, 2025)

TCLF and Heritage

As the value of TCLF sectors is recognized beyond its economic activities and into the realm of cultural expression, the roadmap to innovation and sustainability becomes more complex.

From French *haute couture* to Italian leatherwork and Romanian traditional embroidery, Europe is rich in traditions and craftsmanship, often unique from one region to the next. Indeed, crafts and TCLF can be viewed as having a symbiotic relationship as craftsmanship and heritage adds quality and a way to differentiate oneself in an authentic manner. As modern consumers recognize the relevance

of heritage and craftsmanship, the link between crafts, fashion and art is now more important than ever, especially when considering the increased uptake of digital technologies in TCLF (Tuite & Horton, 2019). At the same time, SMEs and independent makers often need additional support to modernize. Craftsmanship represents quality, authenticity, tradition and heritage (Tarquini et al, 2022), and it generally requires specific processes, which can make the revitalization and market integration process more difficult (Lai et al, 2022). Without new generations of skilled craftspeople, and without adapting to digital-age market demands, some heritage crafts risk fading away. Therefore, linking cultural heritage with technology is seen as a win-win: it helps preserve and revive traditional skills, while injecting fresh creativity and efficiency into the TCLF sectors.

Revitalizing and building upon the knowledge of each practice by ensuring artisans, designer, SMEs and technologists are engaged in an open continuous dialogue and creation process is key to preserving heritage skills while driving social and environmental innovation. This has been CRAFTIT4SD project's ambition and proven concept through its multiple pilots across Europe, as it combined research, experimentation and collaboration to support and future-proof the new generations in a CCSI driven green transition.

This project, however, is no isolated initiative, as programmes and initiatives across Europe try to bridge heritage, culture, creative sectors and TCLF (Braniste, 2021). LVMH, for example funded their own excellence institute focused on training new generations in luxury craftsmanship, with the goal of preserving working knowledge of heritage craftsmanship (Brown et al, 2022). It has been shown that, by ensuring an environment rich in stakeholder diversity, considerate of both the unique traditions and knowledge and the new technologies available, one can create an interdisciplinary learning and creative space that yields high value-added products with a strong sense of place, authenticity and sustainability (Casciani & Chkanikova, 2023).

In practice, this means that preserving traditional skills and styles goes together with exploring new tools and methods to reinvigorate them for contemporary end-consumers. The craft sector in the EU today embodies a blend of tradition and innovation, where age-old techniques meet modern design and technology (European Crafts Alliance, 2025). One example of how technology and traditional craftsmanship can coexist is the Harris Tweed handwoven fabric of Scotland and how they integrated 3D Printing and CAD design to modernize their production through 3D printed loom parts that are affordable and easy to access and fast, while still preserving tradition (Schwaar, 2025). Far from replacing artisans, technologies like 3D printing can be used to complement traditional craftsmanship allowing artisans to, for example, prototype complex new patterns or components that would be impractical by hand, expanding creative possibilities without eroding authenticity.

The drive for innovation and sustainability

Digitalisation and sustainability have become two key goals for the TCLF sectors. On one hand, digital transition and innovation (such as 3D printing, Artificial Intelligence, XR, 3D designs, automation, sales and more) offers tools to increase efficiency, enable customization and drive consumer engagement and build

competitive advantages (Wu, 2024). According to a McKinsey Report, digital leaders in the sectors outperform laggards by up to 68%, arguing that digitalization has become a matter of resilience and survival on the market. On the other hand, the urgent need for sustainability remains a decisive response to climate change as the industry remains a major contributor to resource use, waste generation and CO2 emissions. As a result, there is a push from policymakers and consumers to change the status quo of the sectors. For example, the EU's Strategy for Sustainable and Circular Textiles (2022) sets a vision that by 2030 textiles placed on the EU market will be long-lasting, reusable, repairable, recyclable, and largely made of recycled fibres. Achieving this will require companies to innovate in product design, technologies, materials, and business models (such as circular and service-based models) all while maintaining their connection to their heritage.

As the TCLF sector is affected by the rise in fast fashion and hyper-competitive landscapes, it can be more difficult for companies to transition to a more sustainable approach (Khatami et al, 2024) yet for companies to remain competitive, innovating is crucial. As stated, embracing new technologies can help the TCLF sector to differentiate their products while adhering to the new sustainability requirements of the market. In fact, manufacturers, fashion brands and retailers are increasingly adopting the latest technologies such as AI, blockchain, circular solutions and 3D printing, amongst others. to bring greater efficiency, better, greener fashion, improved manufacturing and better data management and business models (Khatami et al, 2024; EC S4TCLF). In short, innovation in this sector is not just about technology for its own sake, it's about empowering a mostly small-business industry and its workforce to adapt and compete in a highly competitive global market while ensuring the solutions support a better, greener industry for everyone.

3D Printing: A new way for Sustainable Innovation in TCLF

One cutting-edge technology that seamlessly integrates technology, creativity and sustainability, making inroads in both fashion and craft is 3D printing, also known as additive manufacturing, which creates 3D objects based on 3D digital models by depositing thin layers of materials in succession. 3D Printing reduces the entire production process to only two phases, first being the design of the digital file and second the printing itself (Lin M, 2022). The technology has been so successful that it's now been adopted worldwide in various manufacturing industries, like fashion, jewellery, car manufacturing and toy manufacturing. Traditional manufacturing processes are time and resource intensive, requiring high amounts of processing and finishing and produce significant waste. Additive manufacturing such as FDM is, by comparison much faster, requiring less processing and finishing with less resources and in shorter production windows.

Among emerging technologies, 3D printing stands out as a promising tool to drive innovation and sustainability in the TCLF sector. Initially used for rapid prototyping in product design, 3D printing has evolved to enable direct fabrication of fashion items, accessories, and even textile-like structures (Anamika, 2025; Objective 3D 2024; Creality, 2025). Its key advantage is the ability to create complex geometries with minimal material waste. As an additive process, it only uses the material needed for the object, unlike traditional subtractive cutting that

leaves waste (NYES, 2025). This precision supports eco-design principles focused on waste reduction and efficient resource usage, an important aspect of sustainable fashion development. For example, a designer can 3D-print shoe sole or a handbag component in exactly the shape required, regardless of complexity level, cheaper, faster all while avoiding offcuts (Notenboom, TPI). Prototyping also becomes faster and more efficient, meaning designers can iterate new ideas without large costs.
Beyond waste reduction, 3D printing opens avenues to personalization and local, on-demand production, which can shorten supply chains and reduce inventory waste. In fashion, this technology has already produced avant-garde creations, from 3D-printed haute couture dresses to bespoke jewellery and footwear components, with many brands and creators adapting the technology for real, practical integrations that go beyond the runway. For example a recent collaboration between Balena and Variable Seams (Griffiths, TCT, 2025) used 3D printing in combination with bio-based materials to create flexible, wearable garments that are fully circular in their lifecycle, showing that additive manufacturing can go hand in hand with durability and circularity.

3D-Printing and the Regional TCLF Context: Costs, Learning and Integration

Looking closer to home, the North-East region of Romania has long been a hub for textiles, clothing, and crafts, where heritage techniques such as weaving, embroidery, and leatherwork remain integral to local identity. Within the CraftIT4SD pilot in Iasi, 3D printing has been introduced as a tool to explore how these traditions can evolve in line with modern sustainability and innovation goals. The pilot demonstrated that additive manufacturing, even with modest FDM equipment, can be used to produce capsule collections that combine traditional fabrics with digitally fabricated details, showing both the creative and environmental potential of this technology.
Yet the perspective of regional companies that have not yet adopted 3D printing provides important context for the road ahead. Interviews conducted by Reginnova NE with nine SMEs in the TCLF sector highlight a nuanced picture: awareness is high, interest is growing, but adoption remains cautious.
All companies were aware of 3D printing, often associating it with avant-garde or experimental design. As one designer put it, it is a “fascinating technology that enables complex and experimental designs, but so far I noticed it mostly in avant-garde fashion rather than everyday wear” (Cristina Boengiu, UNDASHAPES). This echoes the more global state of the 3D printing technologies in fashion, as additive manufacturing has, so far, been more common in conceptual, artistic and runway-focused high-end pieces rather than in regular TCLF production, largely due to material and processing limitations (Kim et al, 2019).
As we documented the potential applications of 3D printing, we noticed a clear focus on small-series, niche, and high-value applications, such as accessories or limited collections, where customization and differentiation outweigh cost disadvantages (Spahiu et al, 2020). When we asked whether they had considered using 3D printing, companies were responses aligned with theoretical findings. Four had thought seriously about it, four had not, and one expressed uncertainty. Many recognized the potential for customization, waste reduction,

and storytelling, seeing opportunities in limited-edition or accessory-based applications. “It would be interesting to experiment with limited capsule collections featuring small 3D-printed details or unique closure systems, combining functionality with distinctive design” explained Cristina Boengiu from UNDASHAPES. Others emphasized that the technology could be powerful if aligned with heritage values: “A thoughtful and responsible combination of tradition, natural materials, and 3D innovation could open interesting possibilities in the future” (Mia Ungureanu from Trucouture).

For more traditional makers, however, scepticism remains. The sensory value of craftsmanship was often described as irreplaceable: “I like to see how leather is shaped by craftsmen in my team.”; While others questioned its relevance to their practice: “I don’t know how 3D tech could fit in processes that rely on natural fibers and an organic feel and look.”

When asked whether 3D printing could be viable for their business, most respondents leaned toward a conditional “maybe.” They acknowledged advantages such as on-demand production, prototyping, and accessory creation. As Nicoleta Toma put it, “It lets us create unique, customizable products on demand without overproducing, which saves resources and allows us to offer something special to customers”. For others, it unlocked new creative potential: “Bring to life concepts I cannot realize with fabrics” (Sabina Georgescu from SABINNE). But these possibilities were tempered by concerns about costs, training, and especially the availability of sustainable materials. “Its viability would depend on several factors, such as the availability of truly sustainable and affordable materials, as well as the ability to integrate them smoothly with my existing production process” argued Cristina Boengiu. Echoing this, Mia Ungureanu stressed that “if 3D printing can help us experiment with new forms or create sustainable solutions while still honouring craftsmanship, then it could bring interesting opportunities for the future.”

3D Printing Expert interviews help contextualize these concerns. According to Radu Firicel, 3D Printing Specialist and lead expert for the CraftIT4SD 3D Printing pilot, the technology has a clear learning curve: “FDM printers weren’t really made for printing directly onto textiles or for use in fashion(...). You need to understand how the materials behave and what your printer can and can’t do. Once you figure that out and set up a consistent workflow, it actually becomes quite repeatable. But before starting any real production, it’s essential to test peel strength, flexibility, abrasion resistance, and wash durability.” This reflects wider findings in the literature that material testing and workflow standardization are critical for adoption in fashion.

Cost concerns also surfaced strongly in both company and expert views. One SME noted: “It’s too expensive to buy a printer just to experiment with something.” Expert Kjell Neumann, coordinator of Hanze Makerspace confirmed that this is a systemic issue: “The *cost-benefit comparison comes first*: additive manufacturing can often cost more on time, energy, labour, and capital than traditional processes. So the unique abilities of the process need to make sense versus these increased investments.” This is consistent with some cost-benefit studies of FDM, which show that while machines are relatively accessible compared to other additive technologies, based on the desired application of 3D printing,

speed, finishing, and scalability may limit competitiveness against traditional mass production (Spahiu et al, 2020; Nie et al, 2023).
Despite the doubts, a majority expressed willingness to explore the technology under the right conditions. Five out of nine companies said they would be open to adopting 3D printing if barriers such as costs, quality assurance, and training were addressed. “We would need to ensure high quality, manage costs, get some training and test proof of concept to see how our designs and materials translate into 3D objects” (Nicoleta Toma). Another noted: “Ultimately, I would be interested in experimenting in a way that enhances creativity and functionality, without compromising the sustainability and quality standards” (Cristina Boengiu). Yet for some, financial constraints remain a decisive obstacle: “It’s too expensive to buy a printer just to experiment with something.” And a few felt the approach simply did not match their ethos of slow fashion and waste-fabric reuse: “Seems like an intangible solution for a small fashion studio that is focused on using waste fabric for slow fashion” (Claudia Nemes from ARCSTUDIO).
These voices underline a broader insight: regional TCLF companies tend to see 3D printing as a potential ally rather than a replacement for traditional craftsmanship. They emphasize sustainability, creative value, and process compatibility as non-negotiables. As Mia Ungureanu from Trucouture summarized: “For me, the key is finding a responsible way to let technology support and enhance these traditions, not replace them.” This perspective highlights the value of initiatives like CraftIT4SD, which provide proof of concept, training opportunities, and collaborative experimentation. By lowering barriers and demonstrating practical applications in real collections, such pilots can transform cautious interest into adoption, ensuring that 3D printing becomes a tool for regional creativity, sustainability, and competitiveness, rooted in Europe’s TCLF heritage.

3D Printing: From Experimentation to Implementation
It became clear that 3D Printing applications in TCLF sectors and beyond are moving far beyond initial experimentation co concrete implementation. This offers new opportunities for companies and creators alike to shift towards new models and techniques. However, understanding where the technology fits best, and with what materials remains critical for anyone considering adopting it.
According to Radu Firicel, 3D printing expert in the CraftIT4SD pilot at TUIASI, and Kjell Neumann, Hanze Makerspace coordinator, the most relevant uses today cluster around rapid prototyping, unique structural enhancements, and hybrid material integration.
“Rapid prototyping of structures and designs” is one of the most highlighted applications of the technology as it allows designers to iterate quickly, testing shapes, patterns, or fit at low cost. Experimentation, however, goes beyond prototyping as both experts pointed to the creation of unique structures, such as 3D-printed layers on textiles that add relief, textures, or custom motifs and can transform an ordinary fabric into a one-of-a-kind work of art.
Material choice another key decision for moving from ideas to usable products. For textiles, TPU is emerging as the standard. “TPU has been proven to adhere better to fabric surfaces than most other materials, especially when combined with thermal post-treatment, which significantly improves bonding strength,”

Firicel notes. This flexibility makes TPU ideal for printing raised patterns, soft trims, or elastic structures that bend with the garment.
For leather, 3D printing can cut tooling costs dramatically: “3D-printed male–female embossing die are ideal for vegetable-tanned leather (…) easy to customize and replace, making them a cost-effective alternative to traditionally milled metal moulds, especially for small series or personalized designs.”
In footwear, TPU again proves versatile: “suitable for soles, surface applications, and even fully 3D-printed components, offering flexibility, durability, and strong layer bonding.” These examples show that experimentation has already identified clear “best fits” where 3D printing complements traditional processes instead of replacing them.
However, adoption requires realism about limitations. Kjell cautions that “additive manufacturing can oftentimes cost more on one or more of time, energy, labour and capital than other traditional processes. So the unique abilities of the additive process need to make sense versus these increased investments.” Furthermore, mass production remains out of reach for the technology: “Scalability is a big concern… competing with the sheer mass production potential of injection moulding or press forming means a constant drive to create faster machines, higher finish end products and more automation of labour-intensive steps.”, suggesting small-scale, custom production might be the best scenario for the technology.
For SMEs, the learning curve is also critical. Firicel warns: “Before starting any real production, it’s essential to do some basic testing – peel strength, flexibility, abrasion resistance, and wash durability. Drying the filament is also non-negotiable, especially with TPU.” Once companies establish a consistent workflow, he adds, results become repeatable showing that training and testing are as important as the printer itself.
Looking ahead, both experts see exciting trends. Kjell points to suspended liquid printing (RLP), which could allow rapid production of complex forms without supports. He also stresses that there is “more opportunity in utilitarian markets like clothing. We haven’t seen half of what is possible if we think a little broader.” Firicel, on the other hand, emphasizes the democratization of technology: “FDM printing is no longer just for prototyping (...) it’s now possible to print your own midsoles, trims, or accessories without industrial equipment (at home).” He imagines a near future where consumers download open-source files and print fashion details onto garments themselves: “Customization could become something fluid and reversible, not permanent. That kind of creative freedom would completely change how we interact with fashion.”
For TCLF companies, the path from experimentation to implementation is clear: focus on areas where 3D printing adds unique value LIKE prototyping, customization, leather embossing, and flexible smaller scale components and be prepared to invest in materials, knowledge, training, and small-scale testing. As Kjell reminds, technology evolves fast: “By the time a team finishes purchasing a 3D printer, there’s already a newer, faster, larger, and often cheaper model available. Staying up to date is an underrated skill.”
For those willing to experiment carefully and implement strategically, 3D printing offers not just novelty but a durable sustainable tool for innovation in the TCLF industries.

Beyond Fashion: Insights from Pioneers

Lilac Porges: 3D Printing meets Robotics

Lilach Porges is the founder and creative director of PROCODE_DRESS, a venture that uses robotic arms to 3D-print garments. An Israeli fashion designer with an academic background in architecture, she integrates parametric design and technology to push the boundaries of garment-making. Porges's work focuses on developing new methods for robot-assisted 3D printed clothing, aiming to reduce waste and merge science, engineering, and fashion into empowering designs.

She has already earned recognition as the NYCxDESIGN Emerging Designer Residency winner (2024) and Arts Thead and Gucci's Global Design Graduate Show winner for sustainable fashion in 2023 highlighting her impact in this space. (Follow her on Instagram @lilachporges for a glimpse of her incredible work.)

Embracing the Technology: Porges' interest in 3D printing began during her fashion studies, where she "became fascinated with how technology could push the boundaries of what's possible in garment-making." Initially, she experimented with 3D printing but "quickly realized its limitations in scale and flexibility," motivating her to seek more advanced solutions. For Porges, new technologies like 3D printing aren't just tools, "they're a way to rethink the fashion system entirely, creating more sustainable methods of production while opening the door to forms and aesthetics that couldn't exist otherwise."

Overcoming Challenges: One early hurdle was accessing the right equipment. "One of my first challenges was simply finding a robotic arm," she recalls. Porges addressed this by reaching out to experts in other fields, eventually partnering with Mark Parsons at Pratt Institute. "That partnership was transformative – it provided not only the technology but also the environment to experiment, adapt, and start shaping what robotic garment-making could look like." This collaboration gave her the technical footing to bring her vision to life.

Impact: Using a robotic 3D printing arm has fundamentally changed Porges's creative process. "The robotic arm gives me the ability to print directly on a human scale, creating continuous forms that operate differently from fabric-made garments," she explains. One moment that made her go "wow" was seeing a 3D-printed piece come off the robot "that didn't behave like cloth at all - it had its own structure, weight, and movement, almost like an entirely new material." That was when Porges realized she wasn't simply imitating fabric but inventing a new textile language through robotics.

Merging Tradition & Tech: Porges believes technology can honour cultural heritage rather than replace it. "Preserving cultural heritage is vital because it connects us to our roots, values, and shared stories," she says. In her view, using 3D printing and robotics is not just about innovation but also about "carrying forward that cultural drive for invention while honouring the traditions that ground me." In other words, the spirit of craftsmanship and heritage can live on, enhanced by modern tools.

Advice to Artisans: For traditional fashion artisans curious about 3D printing, Porges advises approaching it "with curiosity rather than fear." She suggests not thinking of technology as replacing one's handcraft, but as "adding a new tool to

your creative language." What makes an artisan's work unique is their personal perspective and artistry, and technology "can amplify that, not diminish it." Innovation, Porges emphasizes, happens when "traditional skills and new tools meet, and that's where the magic really starts." She also notes the importance of considering long-term sustainability and scalability of these new methods, ensuring that tech-driven fashion can grow responsibly.

Alexis Walsh: 3D Printing Meets Handcraft

Alexis Walsh is a New York City-based fashion designer and artist known for fusing 3D printing with high-end handcraft. Through an interdisciplinary approach that integrates emerging technologies like 3D modelling and printing with traditional craftsmanship, Walsh continually pushes the boundaries of fashion design. She first gained international attention by introducing her 3D-printed "Lysis" collection in 2015, one of the early examples of 3D Printing application on the runway. Since then, she created widely acclaimed pieces and gained global recognition for her groundbreaking work. In 2020, Walsh and Hattendorf co-founded **JAW Studio** in Brooklyn, launching a line of 3D-printed jewellery, accessories, and wearable objects made with sustainable materials like plant-based polymers and zero-waste processes.

(Follow her on Instagram @alexiskwalsh or explore her reality defying work on alexiswalsh.com)

Bringing 3D Printing into Fashion: Walsh's journey into 3D printing began from a desire to create shapes and structures that traditional methods couldn't achieve. "I am a fashion designer and artist, and I was initially drawn to explore 3D printing as a method of fabrication," she says. By designing digitally, she could realize "impossible shapes, using unconventional materials" that would be impractical by hand alone. She also dove into computational design, learning tools like Rhino, Python, and Grasshopper to generate complex forms. Combining 3D printing with handcraft since 2013, Walsh has always balanced new technology with classic techniques: "From the beginning, I have always made a point of combining handcraft with 3D printing and digital technology. I think the integration of these practices will allow the craft of creating by hand to continue into the future, instead of becoming something that gets left behind." This philosophy reflects her commitment to preserving the art of hand-sewing (a skill that runs in her family) even as she embraces digital fabrication.

Rapid Prototyping & Creative Freedom: One major advantage Walsh found in 3D printing is the speed of iteration. "With 3D printing, you are enabled to quickly iterate and produce ideas in a way that is not possible with other fabrication methods," she notes. She can design something digitally and create a finished physical object "within an hour or two." For her, this rapid prototyping capability opens "a much broader path to creating fully realized objects."

Maintaining Craft in the Tech Age: As fashion embraces technology, Walsh emphasizes the importance of keeping craftsmanship alive. "As a fashion designer, I care very deeply about maintaining a level of traditional handcraft within my work," she explains, highlighting how her personal identity is tied to a lineage of sewing. By incorporating hand-sewn elements with 3D-printed structures, she ensures that "the craft of creating by hand to continue on into the future, instead of becoming something that gets left behind." Especially now, in

an age of increasingly “normalized” AI-generated content (which can lead to “low-effort and sloppy outcomes”), Walsh feels the act of creating by hand is even more special and worth preserving as technology is, in her view, a tool to elevate and make craft “even more special”.
Advice for TCLF Companies: Walsh encourages other fashion entrepreneurs and artisans to take the plunge into 3D printing. “The potential applications with 3D printing are limitless, and there is always time to learn,” she says, stressing that the skillset is well worth the effort. She points out that today there are many free beginner-friendly resources including tutorials, videos, and online courses. Her message is one full of optimism for the future of fashion: anyone can start learning new technologies and integrating them with traditional craft is not only possible, but something that can elevate one’s craft.

Justin Hattendorf: A bridge between Industries
Justin Hattendorf is a designer who bridges the worlds of architecture, product design, and fashion. Originally trained as an architect Hattendorf had his first exposure to 3D printing as a rapid prototyping tool. The speed and scalability of 3D printing in that context inspired him to branch out from architecture into industrial and fashion design. Today, he works as a product design lead at a 3D software company and co-directs JAW Studio alongside Alexis Walsh, where he creates 3D-printed jewellery, accessories, and other fashion-related products. Hattendorf describes himself as a “computational designer” and 3D printing enthusiast who loves blending “advanced digital modelling techniques with intuitive tactile interactions”. His goal is to “make complex 3D concepts accessible to all”.
(Explore his work on JustinHattendorf.com for a glimpse of his unique creations.)
Integrating Tech with Design: Hattendorf recalls that while studying architecture, he used 3D printing mainly for fast prototyping models. “At the time, I used 3D printing as a method for fast prototyping. While it wasn’t a perfect way to represent architectural concepts, the speed and scale of 3D printing inspired me to cross over into industrial product design,” he says. Once he moved into product and fashion design, 3D printing became a natural extension of his interest in computational geometry. “I’ve always been interested in how technology influences form-making, so 3D printing was a natural extension of my interest in computational geometry, where data, geometry, and code can come together to create unique designs.” Over the years, Hattendorf has applied 3D printing to prototyping a wide range of items from shoes, consumer products, jewellery & accessories, mechanical parts and beyond, each time exploring how digital tools can shape physical form in new ways.
Early Scepticism to Adoption: Despite his tech-forward mindset, Hattendorf admits he didn’t immediately embrace 3D printing without reservations. “As much as I love experimenting with new technology, I always start as a sceptic,” he notes. In the early 2010s, he found it “especially difficult to come to terms with the low resolution of the PLA printers I was using circa 2012.” Rather than seeing the layer lines and rough textures as flaws, he learned to work with these “material artifacts” of the process. He began integrating the layering textures into his aesthetic, turning a limitation into a design feature. In fact, when he and Alexis design products at JAW Studio, the print direction and support structures are

considered part of the creative process. “The projects that I’m most proud of strike a balance between the aesthetic of 3D-printed material artifacts, novel geometry, and the process itself,” Hattendorf explains, highlighting how embracing the quirks of the technology can lead to a distinctive style.
Speed and Iteration: One of the biggest improvements 3D printing brought to Hattendorf’s work is the vastly accelerated idea-to-product cycle. He points out that bringing an idea to reality is dramatically faster with 3D printing than with traditional manufacturing. “I’ve designed many products for injection moulding, milling, and other traditional methods. Although it’s possible to bring any great idea to life using those methods, the feedback loop from design to physical object is much shorter when you can produce a design in your own home office,” he says. This speed means he can test and refine far more ideas in a given time, ultimately only “committing to the best ones”.
Advice for TCLF Companies: Hattendorf encourages artisans to “always be curious” when integrating new tech. “Even if you’re not sure about trying something new, the best thing you can do is experiment,” he advises. It took him “several years and many failed projects” to fully appreciate and embrace 3D printing’s value. He emphasizes that finding the right synergy between technology and handcraft can take time. “Once we started combining 3D printing and traditional hand craft, only then was I certain that it was the right medium for me,” he shares. His journey teaches that persistence and openness to failure are key: by continuously experimenting, traditional designers can discover how digital fabrication complements their craft. Hattendorf’s message to fellow creatives is clear: don’t be afraid to try new tools, as they might just unlock the next level of your creative potential.

Conclusion

Overall, the European TCLF sector SMEs should treat heritage not as a brake, but as a springboard. By enabling continuous open dialogue and co-creation activities throughout the ecosystem brands can use 3D printing more purposefully to strengthen, rather than replace, traditional craftsmanship. By innovating they can enable the creation of higher-value products with less waste and richer stories for end consumers.
Additive manufacturing is a targeted tool rather than a substitute, and the best short-term fits are clear: rapid prototyping to shorten design cycles, textile enhancement using unique gravity defying shapes using flexible polymers for durability and functionality and material embossing though low-cost bespoke female-male die. Footwear components can also benefit from 3D printing as new lattices and elements can deliver a unique performance. In each case, 3D printing should be used in combination with heritage craftsmanship practices to elevate and preserve authenticity.
For many companies, successful adoption hinges on three basic aspects: cost-benefit analysis, where the complexity and customization needs of creators will play a huge part, skills and testing and process integration as the technology needs to fit the concept and process of the company implementing it. Pilots such as CraftIT4SD show that shared knowledge, open innovation, mentoring, and cross-disciplinary teams can turn curiosity into capability.

Companies should also stay agile as the tech moves fast. Start small, learn quickly, standardize what works, and scale only where value is proven. The call to action is simple: choose one high-value use case, find a space where you can test and discuss about your process, run your tests with clear quality and sustainability metrics, capture the learning, then repeat. And above all, stay curious. That's how Europe's TCLF businesses turn 3D printing from a compelling experiment into a durable capability that protects heritage by making it future-ready.

Resources

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