CRAEFT

care, judgment, dexterity

Design Pilot: Integrating Digital Tools and Traditional Craft

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Executive summary

This deliverable presents the *Design Pilot* and synergies between traditional craft and contemporary design through digital innovation and methodological exploration. The introduction outlines the purpose and scope of the Design Pilot, emphasising its role in preserving traditional crafts while integrating them into contemporary design workflows. The rationale highlights the need for structured interventions to address the evolving relationship between craft and design, particularly in the context of digital transformation and sustainability.

Section 2 focuses on a review of the state of the art and explores the historical intermingling of craft and design within the European context, tracing its evolution from the key role of Expositions Universelles in the 19th century to its contemporary concerns. The analysis further examines contemporary dynamics, such as the role of digital tools, sustainable practices, and the ongoing dialogue between authenticity and cultural legacy. This section also identifies key challenges and opportunities in maintaining the craft's relevance in the present-day design ecosystem.

Section 3 unfolds the *Design Pilot* methodology structured around an iterative and co-creative process. It begins with an investigative phase that assesses designers' engagement with craft, followed by digital tools tailored to enhance their practices. A mapping exercise tracks "design" occurrences across the Representative Craft Instances (RCIs), ensuring a comprehensive understanding of diverse craft traditions. The conception phase establishes flexible workshop formats that balance traditional techniques with digital innovation. A structured timeline outlines key milestones, from planning and pilot execution to mid-term reviews and final consolidation.

In Section 4, we present technical tools that were employed in the pilot. These are craft-specific simulators that aid the product design, reconstruction of practitioner motion as an avatar from video, and interfacing with 3D printing to create prototypes of the designs.

As a structural feature, the *Design Pilot* integrates technological innovation, using digital tools to improve craft practices. Section 4 explores the role of emerging technologies in expanding the creative possibilities of artisans and designers.

A series of case studies illustrate the Pilot's application across different RCI domains:

- Limoges Porcelain**:** The *Porcelain Design Studio* explores the intersection of crafts and a tailor-made digital toolkit focusing on gestural exploration.
- Aubusson Tapestry: *The Tapestry Design Studio* investigates how weaving traditions can incorporate new visual technologies.
- Nancy Glassblowing**:** The *CERFAV Design Pilot* examines how glass and interactivity redefine material engagement.
- Yecla Woodcarving: The CETEM Design Pilot highlights adaptive strategies in wood-based craftsmanship.
- Tinos Marble-carving and Ioannina Silversmithing: The *PIOP Design Pilot* demonstrates how design can serve as a tool for heritage preservation and sustainable craft practices.

The deliverable outlines in Section 5 the Pilot's key findings and highlights its potential for broader application. The *Design Pilot* reinforces craft's role in contemporary design and is a foundation for future initiatives integrating tradition with innovation.

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Abbreviations

AR	Augmented Reality
CH	Cultural Heritage
RCI	Representative Craft Instance
VR	Virtual Reality

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1. Introduction

1.1 Purpose and Scope

This deliverable presents the *Design Pilot*, an initiative dedicated to synergies between design, digital technologies, and traditional craft practices. The pilot's overarching goal is to demonstrate how computational tools and design methods can bolster craft-making, broadening the creative and innovative horizons for artisans, designers, and researchers alike.

First, the deliverable offers a state-of-the-art literature review and ongoing debates on craft–design convergence. Drawing on historical precedents, it situates contemporary initiatives within a lineage of innovation that stretches from the Arts and Crafts Movement to current experiments with parametric software, extended reality, and additive manufacturing. It then outlines the methodological framework that underpins the *Design Pilot*, explaining how collaborators from different fields—craft, design, and technology—work in tandem to ensure systematic integration of digital tools.

Following this methodological exposition, the deliverable addresses the technological innovations conceived or refined through the pilot, including specialised software workflows, sensor-based systems, and collaboration platforms. This section includes empirical data that gauges the impact of these tools on productivity, sustainability, and creative output. The final segment of this deliverable details the *use cases* developed within the diverse Representative Craft Instances (RCIs). These case studies illustrate how contextual factors—such as local materials, cultural heritage, and resource availability—and technological choices influence the pilot's application and outcomes.

1.2 Rationale for the Design Pilot

The *Design Pilot* emerges from the growing recognition that craft and design, traditionally viewed in the modern world, as separate spheres, are increasingly convergent. Artisanship is often linked to regionally rooted techniques and an intimate understanding of materials, operating within the localised and small-scale context of the workshop. In contrast, design functions at the scale of industry, relying on computational methods for rapid prototyping, mass production, and global market responsiveness. This opposition underscores the fundamental difference between the handcrafted precision of the artisan and the standardised, efficiency-driven industrial design processes [9]. Bridging these two domains presents significant potential for enhanced creativity, collaborative knowledge exchange, and methodological rigour. One central motivation for the pilot lies in its capacity to foster novel forms of creative experimentation. When craft practitioners and designers combine their expertise, they introduce one another to new techniques and conceptual frameworks. Artisans can move beyond localised processes to explore contemporary aesthetics or functional innovations, while designers benefit from the tactile intelligence and cultural depth embedded in craft traditions [7]. This dynamic fusion of perspectives frequently yields hybrid objects and design solutions that neither group might have developed independently.

A second justification for the pilot involves its role as a site for systematic testing. The *Design Pilot* is a quasi-experimental environment in which new technologies—ranging from 3D scanning to motion capture—can be applied, assessed, and refined. These experiments offer valuable feedback on how digital

workflows affect cost efficiency, material optimisation, and cultural fidelity. They also clarify how digital processes can be adapted to accommodate the constraints of different craft communities [16]. Such an evidence-based approach promotes iterative improvement and contributes to the broader discourse on the sustainability and scalability of craft–design collaborations [5].

Through structured collaboration, rigorous methodology, and targeted technological innovation, the *Design Pilot* underscores the complementary nature of craft and design. It demonstrates that the tension between heritage and innovation need not be antagonistic; instead, it can be harnessed to create new products, refine work processes, and enhance the vitality of craft communities. By bringing together craftspeople, designers, and researchers, this initiative aligns with academic research objectives and real-world needs, ultimately guiding the evolution of artisanal practices in a digitally driven era.

2. State of the Art: Craft–Design Synergy

Craft practices have historically underpinned modern design by uniting manual skill, material knowledge, and aesthetic intention. Before industrialisation, artisans were the designers, creating objects that balanced functionality with artisanship. As mass production gained momentum in the 19th century, this intimate link between making and designing was disrupted, leading to a clear division: craft was deemed manual labour, and design emerged as a specialised, conceptual discipline. This fragmentation raised concerns over the loss of the craft's cultural and artistic depth, prompting questions about handmade integrity in an era dominated by machines.

A collective response to the challenges posed by mass production emerged, centred on the conviction that craft and design should remain closely intertwined. Proponents of this viewpoint critiqued industrial manufacturing for reducing workers to mere operators and eroding the quality of everyday goods. They argued that those involved in making should also shape the object's form and function, preserving a direct link between creative intent and material execution. By emphasising the intrinsic character of materials and the artisan's active role in shaping them, this approach sought to restore dignity to everyday objects while promoting innovation. It challenged the notion that efficiency and uniformity had to come at the expense of aesthetic and cultural value. The guiding principle was that thorough craft —grounded in a respect for materials, process, and human ingenuity—offered a way to revitalise production without sacrificing the meaningful, hands-on qualities that enhance both maker and user.

Central to these debates was the tension between utility and aesthetics. Craft traditions, with their hands-on approach to material manipulation, offered a nuanced understanding of how objects could serve practical needs while embodying cultural and artistic values. Industrialisation threatened this delicate balance by prioritising speed and uniformity over expressive craft-making. Its critique underscored that aesthetic enrichment and social well-being were not secondary to production efficiency but integral to meaningful design. Although industrialisation would continue to separate design from making, the legacy of Craft and Design synergy laid the groundwork for ongoing conversations about harmonising artisanal skill with modern technologies and market demands.

2.1 Historical European Context of Craft and Design

2.1.1 Craft as the Foundation of Design

Designers have long served as critical intermediaries between preserving traditional craftsmanship and integrating technological innovation. Since the 19th century, during which industrialisation revolutionised decorative arts, designers have played a dual role: preserving artisanal practices while reimagining them in new contexts. The roots of this dialogue can be traced back to the context of the Arts and Crafts Movement where William Morris and his contemporaries advocated for a return to craftsmanship as a reaction against the dehumanising effects of industrial mass production [15]. While this movement sought to resist industrialisation, it also recognised the potential of designers to mediate between artisanal traditions and evolving technologies, shaping products that balanced functionality and aesthetic value. Morris's workshops, for instance, employed mechanised looms alongside handweaving techniques, blending the old and new to create practical and beautiful textiles [18].

The Union Centrale des Arts Décoratifs (UCAD), also highlights its pivotal role in bridging the gap between traditional craftsmanship and industrial production in 19th-century France (Froissart 2005). Established in 1864, UCAD aimed to elevate the status of decorative arts by fostering collaboration among artists, designers, and artisans. UCAD's initiatives were instrumental in promoting synergy between art and industry, encouraging the creation of objects that combined aesthetic appeal with practical utility. Through organised exhibitions and the establishment of educational programs, this organisation sought to preserve traditional artisanal techniques while embracing modern design principles. This approach safeguarded cultural heritage and facilitated the adaptation of crafts to contemporary market demands. By acting as a conduit between the localised expertise of craftspeople and the expansive reach of industrial manufacturing, UCAD played a crucial role in ensuring that French decorative arts remained innovative and rooted in tradition during rapid industrialisation. UCAD's efforts led to objects that were not merely utilitarian but also carried significant artistic value, reflecting a harmonious blend of form and function. This integration of artistry into everyday objects exemplifies the organisation's success in merging design and crafts and continues to influence current debates on the relationship between art, craft, and industry.

Similar ideas and practices emerged across Europe in response to industrialisation's rapid expansion. In Belgium, for instance, figures such as Henry van de Velde spearheaded efforts to align craftsmanship with modern industry, believing in the social and aesthetic value of handmade objects. He advocated for the involvement of designers in improving everyday goods, arguing that industrial methods should not overshadow the creative integrity of artisanal work. He believed that thoughtful design, guided by artistic principles, could impart functionality and beauty to mass-produced products, bridging the gulf between maker and machine [25]. A parallel vision appeared in Austria through the Wiener Werkstätte, founded in 1903 by Josef Hoffmann and Koloman Moser. They maintained that traditional craftsmanship was critical for producing objects with genuine aesthetic and cultural worth. Hoffmann and Moser's workshop featured collaborations with cabinetmakers, silversmiths, and textile artisans, combining manual skill with refined design sensibilities in architecture, furniture, and decorative arts. They encouraged designers to remain conscious of cultural heritage and quality over mere productivity [27]. In Scotland, the Glasgow School developed a comparable approach that integrated local craft traditions with forward-looking design, emphasising natural materials, hand-drawn ornamentation, and simplicity in form. The chairs and interior decorations for the Glasgow School of Art, for example, illustrate how carefully orchestrated designs could enhance both function and aesthetic appeal without mechanical uniformity [13].

From its origins, the history of Spanish design has been closely associated with architectural practice and discourse. In the construction of the history of design in Spain, the Catalan impulse stands out, which, since the mid-19th century, was characterised by the search for modernity. Specifically, the city of Barcelona is intrinsically associated with the history of design, and it is worth noting that it hosted the Universal Exposition of 1888, the pavilions of which were later used as the city's first museums from 1891 onwards. In this period, the importance of Catalan Modernism should be noted, which, led by architects such as Antoni Gaudí, drew heavily on local artisanal knowledge—ceramic tiling, ironwork, stained glass—to create buildings whose forms and ornamentation married bold innovation with traditional craft techniques. Gaudí's projects, such as the *Casa Batlló* and *Sagrada Família* in Barcelona, showcased how vernacular materials and handiwork could serve visionary design principles where industrial progress need not undermine regional craft legacies; instead, it could highlight them in new, imaginative ways [19]. In the first decades of the 20th century, the influence of Art Nouveau spread beyond architecture to furniture, ceramics and graphic design, with institutions such as the Escola d'Arts i Oficis, founded in 1924 in Barcelona to train people who were going to work in the city's textile factories. Before the Civil War, the GATEPAC was founded, a group of artists and architects whose objective was to promote rationalist

architecture, influenced by the values of the Bauhaus. Prominent figures within the group include the architect Josep Lluís Sert. Towards the end of the 1950s, product design emerged and broke away from architecture. Thus, considerable development of industrial design from the 1960s onwards, linked to the relative opening of a political and socio-economic context in which industrial development was encouraged. Specialised professional organisations and training centres began to be set up. From the 1980s onwards, the first design exhibitions were organised in major museums such as the Reina Sofia, coinciding with the boom in Spanish industrial design and its progressive internationalisation.

In Greece although, there were parallel efforts to integrate local craft traditions with modern design ideals. In the early 20th century, architects and urban designers—such as Dimitris Pikionis, who designed the famous pedestrian pathways around the Acropolis—drew on stone masonry, folk carving, and regional building methods to shape public spaces that harmonised with the Attic landscape [20]. Pikionis illustrated that traditional skill could coexist with forward-thinking spatial designs and modern urban needs incorporating stonemasons' handcrafted patterns into functional paths and plazas.

2.1.2 Expositions Universelles Bridged Traditional Craft and Modern Industry

The Expositions Universelles further demonstrated this intersection, showcasing innovations in design while promoting traditional craftsmanship from across the globe [12]. For instance, the 1855 and 1867 Expositions Universelles in Paris displayed handcrafted objects, textiles, ceramics, and furniture alongside cutting-edge machinery and manufacturing processes. This juxtaposition allowed for a dynamic dialogue between tradition and modernity, inspiring designers to rethink how artisanal techniques could coexist and benefit from emerging industrial methods. At these exhibitions, designers encountered a global spectrum of materials and techniques, encouraging cross-cultural exchanges that enriched design practices. For example, Japanese woodblock printing and ceramics, presented at the 1867 Paris Expo, heavily influenced European decorative arts and design movements such as Art Nouveau. Similarly, traditional weaving and dyeing techniques from regions such as India and North Africa inspired new design approaches incorporating handmade and industrial elements. These events served as incubators for innovation, encouraging designers to experiment with hybrid forms that married artisanal knowledge with the possibilities offered by new machinery.

Subsequent fairs, such as the 1900 Exposition Universelle in Paris, reinforced this synergy. While popular for its lavish Art Nouveau pavilions and sumptuous displays of furniture, glassware, and jewellery, the 1900 exhibition also underscored how mechanised processes could facilitate large-scale production of objects formerly dependent on handcraft. The French Pavilion, for instance, presented cutting-edge machine looms that replicated intricate tapestry patterns traditionally woven by artisans in Aubusson and Gobelins. Designers observing these demonstrations realised that carefully calibrated machines might preserve—and even extend—the aesthetic vocabulary of handweaving by incorporating finer threads or larger colour palettes more quickly than human weavers could manage [22].

Beyond Paris, the 1904 Louisiana Purchase Exposition (St. Louis World's Fair) in the United States similarly underscored the global reach of these exchanges. Although not strictly termed an Exposition Universelle in the European sense, it hosted significant international pavilions that showcased craft traditions from East Asia, Africa, and Latin America. As with earlier Paris events, the St. Louis Fair juxtaposed handmade textiles, ceramics, and artisanal tools against modern assembly lines and mass-market consumer products. European observers, including designers and manufacturers, noted similarities between certain

indigenous techniques (like African indigo dyeing or Japanese *katazome* textile printing) and their historical traditions, paving the way for cross-pollination in pattern design and colour application [21].

Similarly, at the 1906 International Exposition in Milan—often regarded as part of the broader lineage of world's fairs—organisers highlighted Lombardy's textile industries and artisanal silk-making processes. Traditional sericulture was displayed alongside automated reeling machines that vastly accelerated the extraction of silk threads from cocoons. Italian designers, often linked to the ongoing Stile Liberty (Italian Art Nouveau) movement, integrated these mechanised processes with hand-finishing to produce fabrics that retained regional motifs yet satisfied expanding demands from domestic and foreign markets [11].

Across these exhibitions, the guiding principle was consistent: handcrafted artefacts were on display with new technologies and manufacturing systems. This encounter often motivated designers and artisans to assess how local craft traditions could be adapted or preserved in an era increasingly defined by industrial capability and global trade networks. Patterns, techniques, and materials once isolated to specific regions now circulated widely, encouraging designers to experiment with forms that married artisanal knowledge with the efficiency or precision offered by modern machinery. Such international showcases functioned as *incubators of innovation*, fostering artistic crossovers that not only impacted the immediate era but also laid the groundwork for the ongoing debate on how technology and craft might best coexist in the design of the future.

2.1.3 Modernism and the Role of Design

The 1920s marked a pivotal era in this history, as movements like the Bauhaus and avant-garde approaches redefined the relationship between craftsmanship, technology, and mass production. Designers of this period extended the dialogue between tradition and innovation, exploring new materials, production techniques, and aesthetic ideologies while maintaining a connection to artisanal practices.

Established by Walter Gropius in 1919 in Weimar, Germany, the Bauhaus was born from the desire to bridge fine art, craft, and industrial production. Gropius envisioned a school where students and masters would collaborate in workshops to generate new design, architecture, and applied art approaches. The early curriculum drew on craft-based teaching methods, encouraging students to experience materials firsthand—working with clay, wood, metal, or textiles—before applying these lessons to more industrial processes [27]. When the Bauhaus relocated from Weimar to Dessau in 1925, Gropius and colleagues placed a stronger emphasis on reconciling artisanal craftsmanship with machine-age efficiency. Marcel Breuer's iconic *Wassily Chair (1925–1926)* illustrates this integration, combining tubular steel—associated with industrial manufacturing—with minimalist forms rooted in Bauhaus aesthetic principles. Similarly, Marianne Brandt's metalwork workshop produced household items (lamps, teapots) that showcased precise geometric forms and high production standards, demonstrating that design informed by craft knowledge could thrive in an industrial context. Even after its forced closure in 1933, the Bauhaus continued to influence global design. Emigrating Bauhaus masters—such as Ludwig Mies van der Rohe and László Moholy-Nagy—carried its principles to cities like Chicago, where they fostered new institutions (e.g., the Illinois Institute of Technology and the New Bauhaus). Many Bauhaus ideas—simplicity, functionalism, honest use of materials, and integration of art and industry—would underpin mid-century modern design worldwide. The school's legacy demonstrated that modern design needs not to abandon artisanal integrity, showing that handcraft methodologies (like those taught in the Bauhaus workshops) could inform mass-produced objects.

While the Bauhaus exerted a notable influence throughout Europe, Scandinavian design emerged with its distinct perspective, merging functionalist ideals with a deep respect for natural materials and artisanal traditions. The emphasis on "human-centred" design, seen in Denmark, Finland, Sweden, and Norway, took shape partly through architects and furniture makers who sought to create minimalist, yet warm and inviting objects. Designers like Arne Jacobsen, Børge Mogensen, and Hans J. Wegner in Denmark championed local woods and time-honoured woodworking techniques. Their works, such as Wegner's *Wishbone Chair (1949)*, were simultaneously modern and respectful of centuries-old joinery. In Finland, Alvar Aalto exemplified this synergy by fusing technology (e.g., bentwood processes) with his country's woodworking legacy. His *Paimio Chair (1931–1932)* remains an emblematic piece, combining laminated birch—a Nordic staple—and gentle curves that served both functional and ergonomic considerations. While distinctly modern in appearance, the chair retained a handmade sensibility through the use of local timbers and attention to craft details. Aalto's approach underscored the conviction that true innovation flourishes when designers collaborate with skilled artisans, adapting traditional methods rather than discarding them.

Scandinavian designers also looked outward, collaborating with manufacturers across Europe and the United States. Firms like *Fritz Hansen* in Denmark or *Artek* in Finland bridged artisanal finishing with industrial production. The result was furniture that could be efficiently manufactured in larger volumes without sacrificing the subtlety of craft. This model set a precedent for other European regions, where designers increasingly recognised that the direct knowledge of materials, wood, wool, or metal, was key to producing modern yet timeless objects.

In Italy, postwar designers such as Gio Ponti and Carlo Scarpa embraced artisanal techniques—ceramics, glassblowing, woodworking—to enrich their modern creations. Scarpa's collaborations with Venetian glassmakers at *Venini* showcased how centuries-old glass-blowing skills could be adapted to produce striking contemporary forms. This approach mirrored Scandinavian functionalism and Bauhaus rationalism in spirit while accentuating the expressive qualities of local craft. Following Art Deco's popularity in France, a renewed interest in craft-based modern interiors emerged among figures like Jean Prouvé and Charlotte Perriand. Though known for metalworking and industrial aesthetics, Prouvé's workshop often drew on artisanal input for finishing details, demonstrating how handcrafted qualities could enhance mass-produced components. This interplay highlighted a Pan-European pattern: even as standardisation rose, designers frequently integrated artisanal finishing or region-specific techniques, ensuring cultural resonance and a sense of craft. The result was a flourishing diversity of styles and methodologies, united by the conviction that balancing heritage and innovation yields modern and culturally enduring designs.

As contemporary designers continue to revisit these legacies—sometimes integrating digital fabrication, biomaterials, or generative software—the fundamental principle endures: craft, whether rooted in woodworking, glassmaking, or textiles, can inform contemporary production in ways that celebrate culture, respect materials, and expand creative possibility. By looking at these historical references and pedagogical initiatives, contemporary design remains anchored in the understanding that the heart of modern design is often a wellspring of artisanal skill.

2.2 Contemporary Craft–Design Dynamics

Recent decades have witnessed a renewed interest in craft from designers as a deliberate contrast to mass production. While industrial manufacturing often favours uniformity and scale, many contemporary

designers seek artisanal methods to infuse their work with uniqueness and narrative depth. This shift stems partly from consumer fatigue with standardised products and a growing appreciation for objects that exhibit individual character. At the same time, the global spread of digital technologies and platforms has led to heightened homogeneity in product offerings. In response, practitioners who value handmade elements utilise craft traditions to differentiate their designs and reconnect with localised modes of making. The wider "*maker movement"* amplifies this trend by championing self-production, open-source innovation, and small-scale, workshop-based manufacturing, positioning crafts-related practices as an alternative or complement to industrial models.

An increasing number of practitioners operate at the fluid intersection of craft and design, merging artisanal expertise with contemporary aesthetics, materials, and technologies. Rather than seeing craft purely as a manual pursuit, they embrace its core values—intimate material knowledge, meticulous attention to detail, and storytelling—within a design framework that accommodates rapid prototyping and digitally-based workflows. These hybrid practices underscore that the boundaries between designer and maker are not fixed: a single individual might shift between conceptual planning, hands-on crafting, and advanced technological manipulations, ultimately revealing how craft principles and design thinking can coexist to yield innovative outcomes.

2.2.1 Digital Technology and the Craft–Design Relationship

In the digital age, designers continue their historical role as intermediaries between tradition and innovation by leveraging advanced tools such as computational design, 3D printing, and augmented reality to reinterpret traditional crafts. Digital tools offer unprecedented opportunities to reinterpret, preserve, and innovate age-old techniques. They enable a deeper understanding of the materiality, process, and cultural significance of traditional crafts while opening new pathways for creative expression and design experimentation. The evolving relationship between manual artistry and digital precision reflects a dynamic synergy where the strengths of each approach mutually reinforce the other. Rather than allowing one to overshadow the other, this relationship celebrates the unique contributions, fostering a new era of craftsmanship that bridges heritage and modernity.

Manual artistry offers a tactile, intuitive connection to materials that digital precision cannot replicate. The hand of the artisan imbues each object with individuality, imperfection, and a sense of humanity. Conversely, digital tools provide unparalleled precision, scalability, and the ability to execute complex forms that would be unattainable by hand alone. When integrated thoughtfully, these approaches amplify one another, preserving the soul of traditional craft while pushing the boundaries of design. One notable example of this synergy is found in the work of Studio Formafantasma, an Italian design duo renowned for integrating artisanal practices with technological processes. In their "Craftica" project, they collaborated with artisans to create objects that blend traditional materials like leather and horn with contemporary digital techniques, resulting in pieces rooted in craft traditions and distinctly modern in their execution [2].

The fusion of manual artistry and digital precision is particularly evident in European design practices, where the rich history of craft serves as a foundation for technological innovation. In the Netherlands, Joris Laarman Lab exemplifies the interplay between handcraft and robotics. Laarman's furniture designs often begin as hand-sculpted models, which are then translated into digital forms and refined using parametric software. These designs are fabricated using robotic arms, which mimic the fluid movements of a human artisan to create complex, organic structures. The resulting works, such as his "Bone Chair,"

are a testament to how manual artistry and digital precision can harmonise to achieve groundbreaking innovation.

The synergistic relationship between manual and digital methods has also transformed design education and collaborative practices. In schools such as the ENSAD Limoges, students are encouraged to explore handcraft and digital fabrication, fostering a holistic approach to design. Programs often incorporate workshops where students learn traditional techniques such as ceramics, alongside training in 3D modelling. This dual focus prepares designers to navigate the complexities of integrating tradition with innovation. Providing access to digital tools and training, allows artisans to experiment with new techniques while maintaining their connection to traditional craft practices.

2.2.2 Adaptive Sustainability

Craft traditions also play a crucial role in addressing contemporary sustainability challenges. By nature, many craft processes rely on local resources and low-impact methods, reflecting an ethos of material mindfulness that contrasts with large-scale industrial production. Artisans often engage intimately with their materials, adjusting techniques to reduce waste or reusing offcuts for secondary products. This hands-on approach resonates with the global push toward circular economies and eco-conscious design, as it values durability, repairability, and minimised environmental footprints. In contemporary practice, integrating such “craft thinking” means responsible sourcing, close collaboration with local suppliers, and designs favouring longevity over short-lived novelty. As designers grapple with pressing ecological concerns, the inherently holistic mindset of craft—one that ties together material provenance, cultural identity, and the dignity of making—offers potent insights for forging more ethical and sustainable design paradigms.

Adaptive sustainability also involves aligning traditional crafts with circular design principles. Circular ceramics, for example, develop a system where broken or discarded pottery is digitally scanned, ground into powder, and reused in new creations. This approach ensures that traditional ceramics remain part of a sustainable lifecycle while reducing waste. It reimagines artisanal practices by blending heritage techniques with strategies for resource efficiency, waste reduction, and regenerative systems, positioning traditional crafts as exemplars of sustainable innovation in a contemporary context.

Traditional crafts naturally align with sustainability due to their use of local materials, low-impact processes, and cultural depth. Adaptive sustainability builds on these inherent qualities by introducing modern concepts such as reuse, regeneration, and closed-loop systems. By embedding these ideas into traditional practices, adaptive sustainability ensures that crafts remain viable and meaningful while addressing the pressing environmental concerns of the modern era. Applying circular design principles in traditional crafts involves incorporating biodegradable or recyclable materials like reclaimed wood or natural fibres into production. It also involves designing for longevity, encouraging the creation of modular or repairable products that extend their lifespans and enable reuse or recycling at the end of their lifecycle. Collaboration between artisans, designers, and technologists further enriches this process, with tools such as 3D modelling and algorithmic design optimising production and reducing waste while maintaining the artisanal essence of the craft.

2.2.3 Authenticity and Cultural Legacy

The pursuit of innovation through digital tools must be balanced with a profound respect for the cultural identity and material heritage of traditional crafts. Authenticity begins with a recognition of the cultural context in which a craft originated. Each traditional craft embodies the history, values, and identity of the community that created it. A compelling example is the Venini Glassworks in Murano. Founded in 1921, Venini has worked to modernise Venetian glassblowing by collaborating with contemporary designers while preserving centuries-old techniques. Collaborations with designers like Ettore Sottsass have brought innovative forms and colour palettes to Murano glass, allowing the craft to thrive in modern markets without compromising its cultural roots [24]. By engaging with local lace-makers and integrating their expertise into modern designs, this initiative ensures the survival of the craft while adapting it to contemporary design contexts.

In Europe, traditional crafts are deeply intertwined with the environmental and cultural significance of their materials, serving as both a reflection of regional ecosystems and a testament to centuries of cultural heritage. These crafts are often rooted in the careful selection and use of locally available resources, which not only define the aesthetics and techniques of the craft but also connect them to the identities and traditions of the communities that produce them. For example, natural materials such as clay, wood, wool, or flax in European crafts often mirror the landscapes and climates of their regions of origin. In Scandinavia, wood carving evolved in response to the abundance of forests. Mediterranean countries like Italy and Spain are renowned for their ceramic traditions, which are shaped by the availability of high-quality clay and the long history of interactions across cultures in these regions.

Traditional European crafts also exemplify a relationship with the environment. Many of these practices embody sustainable principles, such as using renewable resources, minimising waste, and respecting natural cycles. For example, the cork industry in Portugal is deeply connected to the stewardship of cork oak forests, which are critical for biodiversity and carbon sequestration. This craft demonstrates how traditional knowledge can support ecological balance, by harvesting cork bark without harming the trees.

There is a growing movement to integrate traditional practices with contemporary design methodologies, emphasising sustainability and cultural preservation. By drawing on the environmental awareness embedded in these crafts, modern makers are redefining the role of materials in design, ensuring that traditional crafts remain relevant in addressing today's ecological and cultural challenges. Crafts exemplify the connections between materials, environment, and culture. They serve as living repositories of sustainable practices and cultural narratives, offering invaluable lessons for how human creativity can harmonise with the natural world.

Authenticity in design also requires empowering the communities that are custodians of traditional crafts. Collaborative projects involving artisans as co-creators—rather than as mere executors—preserve the knowledge and skills embedded in their craft. The European Artistic Crafts Days, organised by the Institut National des Métiers d'Art in France, promotes artisan workshops and public events across Europe. These events provide opportunities for artisans to showcase their work, connect with designers, and foster collaborations that respect and elevate traditional techniques. The Crafting Futures initiative, launched by the British Council, provides another example of collaborative and ethical engagement. The program emphasises co-creation and knowledge exchange, by connecting European designers with artisans from rural communities in Romania, Poland, and Hungary. The initiative has supported textile and woodcraft projects that combine traditional motifs with contemporary design aesthetics, ensuring that the crafts retain their cultural significance while appealing to broader markets.

As designers engage with traditional crafts, they must also navigate ethical considerations regarding intellectual property and cultural appropriation. Authenticity requires acknowledging the craft's origins and ensuring its cultural significance is not exploited or commodified without credit. Initiatives such as the UNESCO Creative Cities Network promote ethical practices by encouraging member cities to safeguard intangible cultural heritage and involve local communities in decision-making processes. Designers like Christien Meindertsma**,** known for her work on material transparency, demonstrate how to honour authenticity in design. Her projects, such as the "Flax Project," trace the entire lifecycle of materials, revealing their origins and traditional processing methods. This commitment to transparency ensures that the craft's cultural and material significance is preserved for future generations [17].

Authenticity and cultural legacy are critical elements in the traditional crafts and modern design dialogue. By respecting the cultural identity of crafts, preserving their material heritage, and fostering ethical collaborations, designers can ensure that traditions endure while remaining relevant in contemporary contexts. This approach honours the communities behind these crafts and enriches the global design landscape with a deeper appreciation for cultural diversity and heritage.

2.3 Challenges and Opportunities

The key to fostering a synergistic relationship between craft and design is balance. Allowing manual artistry to inform digital processes ensures that the craft's cultural, tactile, and emotional qualities are retained. Conversely, leveraging digital tools to enhance manual practices introduces efficiency and new creative possibilities without compromising authenticity. An example of this balance can be seen in the work of Erwan and Ronan Bouroullec, French designers known for blending hand-drawn sketches with advanced computational design. Their iconic "Algae" modular partition system began as a series of hand-drawn organic shapes, which were later refined using digital modelling and mass-produced through injection moulding [24].

A primary challenge lies in the loss of material connection resulting from overreliance on digital tools, ranging from 3D modelling software to automated fabrication processes. When designers and artisans spend the majority of their time interacting with virtual renderings rather than physical substances, they risk becoming detached from the subtle tactile cues and embodied knowledge that inform craft-based practices. This phenomenon is frequently discussed in terms of "deskilling" or a reduction in "hands-on" expertise [23, 7]. According to Sennett, making is inextricably linked to practical wisdom—a process that unfolds through tactile engagement and repetitive experimentation. In digital design, however, tactile experimentation is largely substituted by screen-based interactions, potentially narrowing the sensory feedback loop. Ingold [14] similarly posits that material interactions are foundational to cultivating "thinking-through-making," a form of cognitive practice that emerges from the direct handling and manipulation of materials. When this dialogue between maker and matter is mediated primarily by software, the "textility of making"—the continuous interplay of the hand, eye, and raw substance—may be diluted. This distancing has broader cultural and historical implications. Traditional techniques often carry narratives of place, identity, and heritage, passed down through generations of craftspeople [1]. By relegating craft processes to digital approximation, practitioners risk eroding the "lore" of making—those tacit, context-specific insights that ensure practices remain vibrant and rooted in local culture. Consequently, while digital technologies can undoubtedly expedite production and foster innovation, they also invite a form of "alienation" from material engagement that can compromise both creative intuition and the cultural richness of craft traditions. Maintaining a balance, wherein digital tools serve as

a supplement rather than a replacement for material experience, is thus crucial for sustaining the tactile intelligence at the heart of artisanal knowledge.

Another challenge involves the perception of the craft relative to design, rooted in a long-standing hierarchy that views craft as narrowly manual while design is framed as conceptual, market-driven, and intellectually rigorous. Institutions, schools, and professional bodies tended to elevate design—associated with innovation and abstract problem-solving—above craft, which was often relegated to decorative or purely functional applications. This view overlooks the substantial ideation embedded in craft processes, where exploratory making, material sensitivity, and iterative refinement inform creative decision-making to a degree that rivals any design studio. The divergence between craft and design has been perpetuated by a narrative that compartmentalises creative thinking: design is seen as strategic and outward-facing, while craft is perceived as rooted in tradition and inward-looking. Yet, in many workshop environments, craftspeople routinely conceptualise, adapt, and troubleshoot, reflecting a form of "process innovation" that parallels or exceeds that of professional designers. The hand–mind engagement inherent in craft means that ideas are not simply imposed on material but discovered through making, bridging aesthetic ambition with practical know-how. Furthermore, skill-based engagement—typical of craft—enables a deep form of problem-solving that can yield conceptual breakthroughs. Thus, craft and design can be understood as distinct yet equally creative modes of practice, each contributing valuable insights into how objects are conceived, produced, and contextualised. Overcoming the hierarchy requires recognising craft as a domain where conceptual and practical intelligence converges, affirming that innovation is often sparked through physical engagement with materials rather than detached planning alone.

The convergence of craft and technology fosters collaboration between artisans, designers, and technologists and drives a broader democratisation of artisanal practices and knowledge. Initiatives like the Doppia Firma Initiative by the Michelangelo Foundation exemplify how partnerships can bridge traditional craftsmanship and digital innovation. By connecting designers with master craftspeople, these collaborations explore how digital modelling and prototyping can refine processes while preserving the artisanal depth that gives these creations their cultural value. Such efforts innovate and ensure that traditional practices remain relevant in a modern context, where creativity and cultural heritage coexist with cutting-edge tools.

This spirit of integration is further amplified by the transformative potential of digital technologies like virtual reality (VR) and motion capture. These tools democratise access to traditional crafts by breaking down barriers of geography and resources. Aspiring artisans and designers can immerse themselves in the tactile and spatial experiences of creating artisanal objects through VR simulations, learning techniques that once required physical proximity to master artisans. Similarly, digital archives of gestures and processes created through motion capture, preserve endangered craft traditions and make them widely accessible. These platforms not only educate but also provide spaces for co-creation, where designers and craftspeople can collaborate virtually, transcending cultural and geographical boundaries.

The democratisation of craft goes even further with the rise of digital fabrication labs, online tutorials, and open-source platforms. These resources empower a diverse range of participants—from novices to experienced makers—to engage with and reinterpret craft traditions. Digital tools such as parametric design software, laser cutters, CNC milling machines, and 3D printers lower the barriers between idea and execution, allowing individuals to rapidly prototype and refine their ideas. The maker movement, [10], champions this access to personal-scale manufacturing, enabling the wide-ranging public to contribute to the evolution of the craft. This renewed engagement revitalises craft traditions, particularly in regions

where artisanal knowledge may be at risk, by allowing diverse audiences and younger generations to connect with and adapt these practices to contemporary contexts.

By blending accessibility, collaboration, and innovation, integrating technology into craft transforms traditional practices into dynamic, evolving systems. However, this transformation is not without its challenges. Striking the right balance between preserving the tactile authenticity of craft and embracing the efficiencies of digital tools requires careful consideration. While technology can streamline production and inspire new aesthetics, it must remain a complement to, rather than a replacement for, the artisanal essence that gives craft its unique cultural and emotional resonance.

Striking the right balance between preserving artisanal authenticity and embracing innovation is thus a dynamic process. While technology can streamline production and spark novel aesthetics, it must not overshadow the tactile essence of craft. Recognising the challenges and opportunities fosters a robust, evolving dialogue—one in which craft remains vital, and design extends its cultural and creative horizons.

3. Methodology of the Design Pilot

The Design Pilot aims to investigate how designers can effectively harness digital tools not only to drive innovation but also to sustain, reinterpret, and evolve the craft traditions they engage with. This exploration seeks to position digital integration as a bridge between traditional craft-making and contemporary design practices, fostering a dialogue that respects the craft's cultural and material integrity while unlocking creative possibilities. The methodology of the *Design Pilot* is rooted in an interdisciplinary approach, bringing together designers, artisans, and technologists to collaboratively experiment with tools such as computational modelling, digital fabrication, and augmented reality. By embedding these tools within traditional craft workflows, the pilot seeks to identify methods that preserve the craft's tactile and cultural essence while enhancing efficiency, adaptability, and aesthetic potential. Through iterative processes of co-creation and testing, the pilot highlights the symbiotic relationship between handcraft and technology. It emphasises how digital tools can extend the possibilities of traditional techniques, allowing for the creation of hybrid forms and new design applications while maintaining a connection to the artisanal roots of the craft. This integration supports preserving endangered techniques and empowers craftspeople to adapt to evolving markets and production contexts. The methodology focuses on contextual adaptation, recognising that craft traditions are shaped by the cultural and material environment, by tailoring digital tools to these unique contexts. The pilot ensures that innovation respects local knowledge and practices. Ultimately, the *Design Pilot* aims to provide a replicable framework for integrating technology into craft processes, demonstrating how tradition and innovation coexist to sustain and enrich both fields.

3.1 Listening and Understanding the Needs of Designers

The first step in the *Design Pilot* methodology is to address the challenges and opportunities faced by designers who work at the intersection of digital and traditional techniques. This process begins by examining how digital technologies—such as computational design, 3D scanning, and digital fabrication—can enhance design processes while preserving the craft's cultural and material essence. One significant challenge lies in maintaining a balance between the precision and efficiency offered by digital tools and the tactile, intuitive qualities inherent in traditional craft practices. While technologies can streamline workflows and introduce new creative possibilities, there is a risk that these tools might overshadow or disconnect designers from their material and cultural context. This tension underscores the importance of ensuring that digital integration supports artisanal knowledge and handcraft, rather than supplanting it. To navigate this balance, the *Design Pilot* emphasises active collaboration with designers. By involving practitioners directly in the experimentation and adaptation of digital tools, the methodology ensures that real-world challenges and insights shape the development of new approaches. Designers' practical experiences are essential for identifying how digital tools can enhance, rather than dilute, their creative control. This collaboration also helps uncover innovative ways to merge manual artistry with technological precision. Central to this step is the idea that creative control must remain with the designer. Digital tools are seen not as replacements for traditional methods but as extensions that allow designers to push the boundaries of what is possible in form, texture, and application. At the same time, the direct feedback and flexibility inherent in traditional craft processes—such as the tactile adjustment of materials or the cultural narratives embedded in certain techniques—remain crucial to retaining authenticity and originality. As such, the *Design Pilot* explores how designers can use digital tools to engage more deeply with their material and cultural roots. For instance, MoCap or AR can document and visualise traditional craft processes, allowing designers to study and reinterpret them innovatively. Such tools bridge the gap

between past and present, ensuring that historical techniques inspire contemporary creations while adapting to new contexts and markets. By examining these challenges and opportunities through a collaborative, iterative approach, the *Design Pilot* lays the foundation for a design methodology that combines the best of both worlds. It seeks to demonstrate how digital and traditional techniques coexist, creating a framework for designers to innovate while preserving the cultural integrity and tactile richness central to the crafts they engage with. This step ensures that design remains connected to its roots even as it evolves to meet future demands.

3.1.1 Initial Investigative Phase: Exploring Designers' Use of Craft in Practice

The first phase of the *Design Pilot* methodology focuses on understanding how designers engage with craft in their design practices, particularly when integrating traditional techniques with digital tools. Through unstructured interviews, this phase investigates the motivations, strategies, and challenges designers face when incorporating craft into their work. This process ensures that the methodology reflects how craft informs contemporary design, emphasising its cultural, material, and aesthetic dimensions.

Interviews: Unpacking the Role of Craft in Design

The interviews delve deeply into how designers draw on craft traditions in their creative processes. The interviews aim to uncover:

- Craft as Inspiration: How designers use traditional craft techniques or motifs as sources of creative inspiration.
- Material Engagement: How familiar with craft materials, such as wood, ceramics, or textiles, informs their design decisions.
- Integration of Craft: Practical methods designers use to incorporate handcrafted elements into digital workflows, including prototyping, finishing, or visual storytelling.
- Cultural Narratives: How designers use craft to communicate cultural identity, heritage, or local traditions in their projects.

These interviews also address how designers balance the authenticity of craft with the precision and efficiency of digital tools, highlighting instances where digital processes enhance or detract from their engagement with craft.

Outputs of the Investigative Phase

The insights gathered during this phase will form a comprehensive understanding of how designers use craft in their design practice**.** The findings will include:

- Key motivations for incorporating craft into the design, including cultural storytelling, material experimentation, and aesthetic enrichment.
- Practical approaches for merging craft with digital workflows, including examples of hybrid techniques.

- Challenges and limitations in using craft, particularly when working at scale or integrating with contemporary tools.

This phase ensures that the *Design Pilot* aligns with the lived experiences of designers who see craft as vital to their practice.

3.1.2 Co-Creation: Designer-Led Development of Digital Tools and Workflows

The second key methodological tool in the *Design Pilot* is the co-creation process, which prioritises active collaboration between designers, artisans, and technologists. This approach ensures that the development of digital tools and workflows is directly informed by the practical knowledge, creative processes, and cultural insights of the practitioners who engage with them. Co-creation fosters innovation and promotes the relevance, usability, and cultural sensitivity of the tools being developed.

Co-creation is grounded in several core principles that ensure the development process is both practical and responsive to the needs of designers. At its core is the principle of practitioner-driven insights, where the experiences, challenges, and aspirations of those actively engaged in craft-based design serve as the foundation for innovation. Their firsthand knowledge directly informs decisions about tool functionality, interface design, and the integration of workflows, ensuring that the outcomes are relevant and tailored to their specific practices. Another key principle is its iterative development, which emphasises the importance of designing, testing, and refining tools, and workflows through multiple rounds of feedback. This process allows for continuous improvement, ensuring solutions remain adaptable to real-world contexts and evolve in response to practitioners' changing needs. Finally, collaborative innovation plays a central role in co-creation. By combining the expertise of artisans, designers, and technologists, this approach generates hybrid solutions that leverage the strengths of traditional craft-making and contemporary technology. Together, these principles create an inclusive co-creative environment, that is adaptive and focused on producing tools and methodologies that enhance craft and design practices.

Steps in the Co-Creation Process

- Engagement with Practitioners: Co-creation begins with structured workshop sessions where designers articulate their needs and aspirations. These sessions focus on understanding how practitioners currently use digital and traditional tools, the limitations they face, and the features or processes that could enhance their practice.
- Prototyping Tools and Workflows: Based on the input gathered, prototypes of digital tools and workflows are developed. For example:
    1. Digital Tools: Software for 3D modelling, augmented reality interfaces, or motion capture systems designed to document and reinterpret craft techniques.
    2. Workflows: Guidelines for integrating digital fabrication with manual finishing or combining computational design with traditional material processes.

Prototypes are presented to practitioners for initial evaluation, enabling early feedback on usability, functionality, and cultural fit.

- Hands-On Testing and Feedback: Practitioners test prototypes in real-world contexts, such as workshops or collaborative projects. This hands-on phase allows for a detailed evaluation of how well the tools align with their creative processes. Feedback sessions focus on:
    1. Identifying barriers to adoption (e.g., technical complexity, lack of material responsiveness, engagement challenges, etc.).
    2. Refining features to enhance accessibility and usability.
    3. Exploring how tools can better support cultural and material authenticity in craft practices.
- Iterative Refinement: Insights from testing are used to refine the tools and workflows. Multiple iterations ensure that the final outputs are practical, culturally respectful, and capable of enhancing creative and functional aspects of craft-design integration.
- Collaborative Documentation and Training: Co-creation culminates in the collaborative development of documentation and training materials, ensuring practitioners can confidently adopt and adapt the tools. This includes tutorials, case studies, and usage guides co-authored with practitioners to reflect their expertise and insights.

Outcomes of Co-Creation

The co-creation process ensures that digital tools and workflows are designed with key priorities, making them practical and meaningful for the practitioners who use them.

- By aligning digital tools with practitioners' real-world workflows, they become more intuitive and adaptable to diverse contexts.
- Practitioners' inputs ensure that digital tools respect and preserve the cultural narratives and material traditions fundamental to craft practices.
- Actively involving practitioners fosters trust and a sense of ownership, promoting the widespread adoption of the resulting innovations.

Co-creation transforms digital integration into a collaborative journey, enabling designers to shape the tools and workflows to sustain and evolve their practices. This approach ensures that the *Design Pilot* produces innovative outcomes rooted in the needs of the craft community.

3.2 Mapping "Design" Occurrences across the RCIs

The diversity of each RCI, encompassing distinct materials, techniques, cultural traditions, and technological integrations, creates a compelling need to understand how design is used and practised in each specific context. Each RCI represents unique conditions—ranging from the type of craft (e.g., glassmaking, woodworking) to the cultural narratives and resources that shape its practices. This variability means that the roles of design, methods, and tools, can differ significantly. By mapping "design" occurrences across the RCIs, it becomes possible to identify how local conditions influence design approaches, such as adapting traditional techniques to up-to-date workflows or integrating digital tools to enhance efficiency and creativity. Understanding these nuances ensures that the Craeft project respects and supports the individuality of each RCI, while also identifying shared opportunities for collaboration, innovation, and methodological refinement. This mapping exercise ultimately strengthens the capacity of the project to bridge tradition and innovation in culturally and materially relevant ways.

3.2.1 Tracking and Analysing "Design" Across Representative Craft Instances

To fully understand how design is integrated and practised within each Representative Craft Instance, it is essential to adopt a methodology that documents and analyses the diverse contexts, institutions, and local practices involved. This process provides a comprehensive picture of how design interacts with traditional craft practices, materials, and cultural heritage in each unique setting. The approach highlights the diversity of design practices and identifies shared patterns and opportunities for collaboration across the RCIs.

Contextual Analysis: Understanding Local Environments

The first step in this analysis is to examine the cultural, material, and economic contexts that shape each RCI.

- Craft traditions are deeply rooted in the cultural identity of a region, often carrying symbolic meanings and narratives passed down through generations. Understanding these cultural dimensions allows a richer appreciation of how design builds upon and contributes to these traditions.
- The availability and historical use of local materials influence design decisions, from the choice of medium to the techniques employed.
- Economic factors, such as market demand and the positioning of craft in global trade networks, further shape how design functions within each RCI, balancing heritage with commercial viability.

This contextual analysis helps identify the broader forces that shape how design is perceived and utilised in each RCI.

Institutional Documentation: Identifying Key Stakeholders

Equally important is the role of institutions in fostering and guiding design practices.

- Design schools and crafts workshops serve as hubs where traditional techniques are taught alongside design thinking, allowing for the integration of old and new approaches.
- Museums and cultural organisations contribute by preserving and showcasing craft traditions while engaging with contemporary design to make these practices relevant to contemporary audiences.
- Design studios bring together artisans and designers to experiment with innovative methods, often bridging the gap between manual crafts and digital technology.

By examining these institutions, the mapping process captures the structural support and collaborative dynamics that facilitate design practices in each RCI.

Local Practices: Capturing Craft-Design Integration

The core of the analysis lies in capturing local practices, particularly how design and craft are intertwined.

- Closely observing workflows to identify the stages of production where design plays a pivotal role, whether in ideation, prototyping, or finishing.

- The use of tools—traditional and digital—is another critical aspect, as it demonstrates how artisans and designers balance manual techniques with modern technologies.
- Design's impact on aesthetics, from shaping functional forms to creating intricate patterns, is explored to illustrate its creative contributions.
- Successful examples of collaboration between designers and artisans.

These practices are documented through artefact analysis and on-site observations.

Comparative Analysis: Cross-RCI Patterns and Divergences

Once data has been collected from individual RCIs, a comparative analysis is undertaken to identify commonalities and divergences in design practices across contexts. This step highlights shared strategies for integrating design with the craft while revealing unique adaptations that reflect the specific cultural and material conditions of each RCI. By comparing these findings, the analysis uncovers opportunities for knowledge exchange and collaboration between RCIs, fostering a sense of interconnectedness within Craeft.

The results of this mapping process are synthesised into a comprehensive framework that includes case studies, visual documentation, and comparative insights. By tracking and analysing design occurrences across RCIs, this methodology provides a deeper understanding of the role of design in sustaining and evolving craft traditions and establishing a foundation for innovative, culturally sensitive, and collaborative approaches to integrating design with craft.

3.2.2 Flexible Workshop Formats: Adapting to Craft, Material, and Design Cultures

A framework of flexible workshop formats is employed to ensure the Design Pilot methodology is effective across diverse crafts, materials, and cultural contexts. These workshops accommodate varying levels of expertise, objectives, and technological integration, ranging from traditional methods to experimental, technology-driven approaches. This adaptability fosters meaningful collaboration between designers, artisans, and technologists while respecting the unique characteristics of each craft tradition.

The core principles of this flexibility include contextual relevance, which adapts workshops to each craft's specific cultural, material, and technical aspects, preserving its identity. Participant-centred design ensures inclusivity and engagement by addressing the needs and goals of attendees at all skill levels. Finally, progressive exploration supports skill-building and innovation by evolving workshops from foundational techniques to experimental processes. These principles create a dynamic framework that bridges tradition with contemporary design practices.

Hybrid Craft-Design Workshops

Hybrid workshops blend traditional techniques with modern design thinking, encouraging participants to reinterpret traditional practices innovatively. These workshops:

- Introduce digital tools and technologies as complements to manual techniques.
- Focus on co-creation, where designers and artisans collaborate to explore new possibilities.

- Highlight how design can be a medium for cultural storytelling and adaptation.

Experimental and Technology-Driven Workshops

Highly experimental workshops encourage participants to push the boundaries of their craft by leveraging advanced technologies. These sessions foster innovation by:

- Encouraging risk-taking and experimentation with novel materials and processes.
- Exploring how technologies like 3D printing, augmented reality, or computational design can reshape traditional crafts.
- Generating prototypes that fuse digital tool precision with the tactile quality of handmade objects.

Each workshop format is modular and adaptable, enabling customisation to suit the specific needs of different contexts. Activities are tailored to the craft type, aligning with unique techniques and materials of each discipline. The format also accounts for participant expertise, accommodating a wide range of skill levels, from young designers to experienced ones. Additionally, workshops are adjusted based on technological access, ensuring the degree of digital integration aligns with the tools and resources available, making the sessions practical and accessible to a diverse range of participants. By employing flexible workshop formats, the *Design Pilot* ensures that its methodology is inclusive, responsive, and capable of addressing the different needs and potentials of each RCI. This adaptability fosters collaboration and sustains cultural and material relevance in contemporary design.

3.3 Conception Phase

The *Design Pilot* methodology adopts an iterative approach to planning workshops and pilot activities, ensuring they are responsive to participant needs, adaptable to specific craft contexts, and informed by real-world insights. This approach involves continuous refinement based on feedback, case studies, and practical outcomes, creating a dynamic cycle of planning, implementation, evaluation, and adjustment.

3.3.1 The Iterative Planning Cycle

The process begins with defining the goals, scope, and structure of the pilot activity, ensuring alignment with the overarching objectives of the *Design Pilot*. Insights from case studies across the RCIs—CNAM, CERFAV, CETEM, and PIOP—play a crucial role in shaping this initial phase by providing practical examples of how design and craft intersect. These insights help tailor workshop formats, materials, and methodologies to the objectives and contexts of each pilot, ensuring the framework remains practical and adaptable while fostering meaningful interactions between craft and design.

Implementation Phase

It involves conducting workshops and pilot activities in real-world settings, emphasising hands-on engagement and active collaboration. The structure of these sessions remains flexible, allowing for on-the-ground adjustments in response to unforeseen challenges or participant feedback. The focus is on testing the applicability of the planned activities within practical contexts, observing participant interactions with tools and techniques, and documenting the practical and cultural insights that emerge throughout the process.

Feedback collection

Structured feedback is gathered through participant to evaluate their experiences, identify areas for improvement, and capture their perspectives on the workshop outcomes. Facilitators also contribute observations and notes, assessing the effectiveness of workflows, tools, and methodologies. Discussions encourage participants to share successes, challenges, and ideas for refinement. This feedback provides a clear understanding of what worked, what didn't, and what adjustments are necessary to improve the outcomes.

Refinement Phase

The feedback collected is analysed and used to enhance the pilot activities. Refinements may involve adjusting the balance between traditional and digital methods to better align with participant preferences, incorporating additional tools or resources to address workflow gaps, or modifying activities to reflect the cultural and material contexts of the craft more effectively. This iterative process ensures that the pilot evolves to meet the needs and objectives of designers more effectively.

Reiteration and Expansion

The refined workshops and activities are re-implemented to validate improvements and further test their applicability. Iterative cycles continue until the intended outcomes are consistently achieved, creating a robust and adaptable framework for future activities. This iterative approach ensures that the methodology remains practical, effective, and responsive to the evolving needs of participants and the broader objectives of the *Design Pilot*.

3.3.2 Developing Workshop Formats: Balancing Tradition with Digital Innovation

Workshop formats in the *Design Pilot* are carefully developed to respect and preserve traditional craft techniques while seamlessly integrating innovative digital elements. This approach ensures that workshops honour cultural and material heritage while equipping participants with tools and methods that expand creative and functional possibilities.

Respecting Traditional Techniques

Each workshop begins with traditional practices, emphasising the craft's tactile, cultural, and narrative dimensions. Participants are encouraged to engage deeply with the materials and processes that have defined the craft's heritage, starting with foundational techniques. This phase reinforces the value of manual expertise and highlights its continued relevance in up-to-date design contexts.

Introducing Digital Innovation

Once designers have a solid grounding in traditional methods, workshops introduce digital tools to complement and extend these practices. These tools are selected to enhance creativity, efficiency, and precision without overshadowing the artisan's role.

- Motion Capture: Capturing the precise movements of artisans during their work allows for detailed documentation and analysis of traditional techniques. This data can be used to preserve these movements or to inform the design of new tools and processes that mimic artisanal gestures.
- VR Sketching: Virtual reality tools enable participants to visualise and manipulate designs in 3D before physical production. For example, traditional patterns or forms can be reimagined in VR, providing a platform for creative experimentation while retaining a connection to cultural motifs.
- 3D Scanning: High-resolution scanning allows for the digital preservation of traditional artefacts, capturing their intricate details for analysis, replication, or reinterpretation. This ensures that physical objects and their design elements can inspire new creations while safeguarding cultural significance.

Balancing Tradition and Innovation

The workshops are structured to demonstrate how traditional and digital techniques can coexist, creating hybrid workflows that leverage their strengths. For instance, participants might begin by handcrafting a prototype, and then use 3D modelling software to refine its details or create variations. Conversely, a digital design created in VR might be realised through traditional craft-making, such as carving or weaving, to retain the tactile authenticity of the finished piece.

Workshops empower designers with new tools and perspectives, integrating digital elements into traditional workflows. Participants are encouraged to experiment with these technologies, adapting them to their aesthetics. This hands-on approach enhances their technical skills and fosters confidence in using digital tools to innovate within their practices.

3.4 Steps, Timelines, and Milestones for Pilot Execution

The successful execution of the *Design Pilot* requires a clear timeline with defined steps and milestones to guide the process from initial planning to outcomes. Below is a breakdown of the key phases and their associated timelines:

3.4.1 Initial Planning and Setup (M18–M24)

The initial phase of the *Design Pilot* focuses on establishing a robust foundation through detailed preparation and strategic planning:

- Undertake comprehensive preliminary research and contextual analysis for each RCI, delving into its unique cultural, material, and technical dimensions.
- Identify and engage key stakeholders, including designers and institutional representatives, to ensure collaborative and informed planning.
- Design the methodology, workshop formats, and pilot activity framework, carefully tailored to reflect the distinctive characteristics of each RCI.
- Secure the necessary resources, tools, and venues, laying the groundwork for an effective and seamless pilot Implementation.
- Prepare informed consent processes wherever personal data is processed (interviews, recordings, etc.)
- By M24, finalise the methodology and pilot setup, and address all logistical, technical, and cultural considerations.

3.4.2 Pilot Launch and Initial Execution (M24–M28)

The initial execution phase focuses on implementing and evaluating the pilot activities in real-world settings, ensuring active collaboration and practical insights:

- Facilitate the first round of workshops and pilot activities, prioritising hands-on engagement and meaningful collaboration with designers.
- Evaluate the practicality and effectiveness of the planned activities, collecting early feedback to assess their impact and relevance.
- Meticulously document workflows, tools, and techniques employed during the sessions to inform subsequent refinements and analysis.
- By M28, complete the first round of pilot execution, capturing key insights and identifying areas for improvement to refine future activities.

3.4.3 Mid-Pilot Review and Refinement (M28–M30)

The mid-pilot phase focuses on analysing outcomes, refining methodologies, and preparing for the final phase of execution:

- Conduct a comprehensive analysis of feedback from designers, identifying key successes and challenges encountered during the initial activities.
- Refine workshop formats, tools, and workflows based on these findings, ensuring they align more closely with designers' needs and project objectives.
- Re-implement the updated activities, incorporating adjustments to enhance their effectiveness and relevance.
- By M30, complete the mid-pilot review, integrate refinements and lay the groundwork for the final implementation phase.

3.4.4 Final Execution and Outcome Consolidation (M30–M36)

The final phase of the *Design Pilot* focuses on consolidating efforts, implementing refinements, and documenting impactful results:

- Conduct the concluding round of workshops and pilot activities, ensuring all refinements and improvements are fully integrated into the sessions.
- Prioritise the documentation of best practices, successful methodologies, and tangible outcomes, creating a comprehensive record of the pilot's achievements.
- Gather final feedback from participants and assess the overall impact of the activities on both individuals and RCIs, identifying lasting contributions and areas for future exploration.
- By M36, compile a comprehensive report encompassing outcomes, case studies, and practical guidelines for effectively integrating traditional and digital practices, providing a robust foundation for scaling and future initiatives.

The *Design Pilot* methodology establishes a framework that fosters, through design, a deep synergy between craft heritage and digital innovation. Grounded in listening, mapping, and co-creation, this approach ensures that the integration of digital tools enhances rather than detracts from the cultural and

material authenticity of craft traditions. By actively engaging with designers, mapping the unique contexts of each RCI, and designing flexible workshop formats, the pilot exemplifies how tradition and innovation can coexist in mutually enriching ways. The relationship between craft and design benefits immensely from the judicious application of digital technology. Digital tools amplify creative possibilities and enable preservation, adaptation, and storytelling within craft practices. This methodology's emphasis on understanding local contexts and involving designers in co-creative processes ensures that these tools are adapted to the needs and aspirations of craft communities. Looking ahead, the *Design Pilot* sets the stage for forming new partnerships and extending digital integration into other craft domains beyond the current RCIs. By applying the lessons learned to broader contexts, the methodology is a replicable model for other craft sectors, expanding its impact on global craft and design communities. Ultimately, the *Design Pilot* lays the groundwork for a long-term transformation in the crafts sector. It harmonises tradition with technology, ensuring craft practices endure and evolve to meet the creative, cultural, and future economic demands. This synthesis of heritage and innovation creates a sustainable pathway for reimagining the role of craft in contemporary design and beyond.

4. Technological Innovation

The technical tools provided for this pilot were:

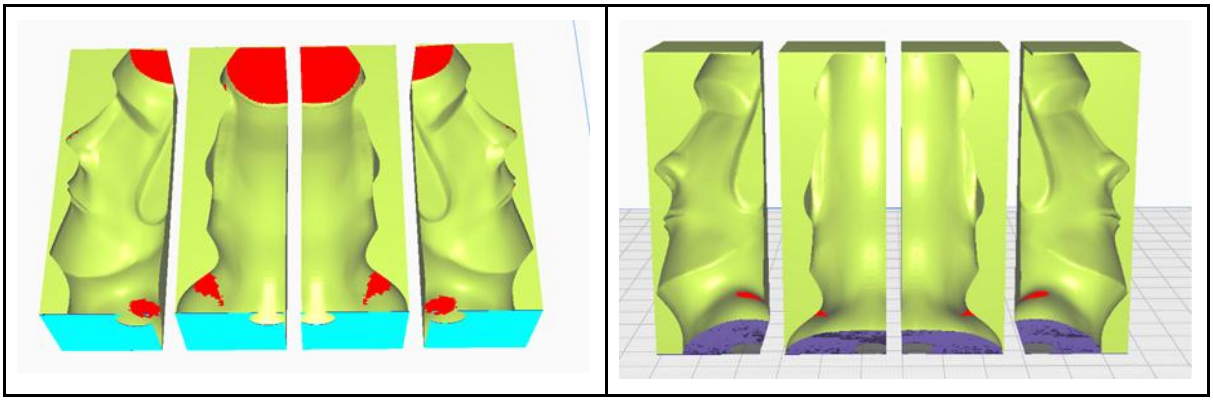
- Craft specific simulators that aid the product design. These simulators predict the appearance of craft products from their 3D models. The 3D models are developed with craft-specific constraints.
- Reconstruction of practitioner motion as an avatar from video. This capability shows the practitioner's posture for ergonomic study or innovative use in converting human motion into 3D models.
- Interfacing with 3D printing to create prototypes of the designs.

4.1 Product design

4.1.1 Moulds

A module was implemented that implements an automatic workflow for generating moulds from existing 3D models using Python and the Trimesh library. The primary objective of this activity was to streamline the mould creation process by eliminating manual steps in CAD software and automating key geometric operations. The methodology focuses on the automated generation of moulds from watertight 3D models, enabling efficient and customisable mould designs for manufacturing applications.

This automated workflow reduces the manual effort required for mould design and ensures basic precision and flexibility in mould configurations. This activity lays the groundwork for more advanced and scalable mould generation solutions in digital fabrication and manufacturing processes in pilots.



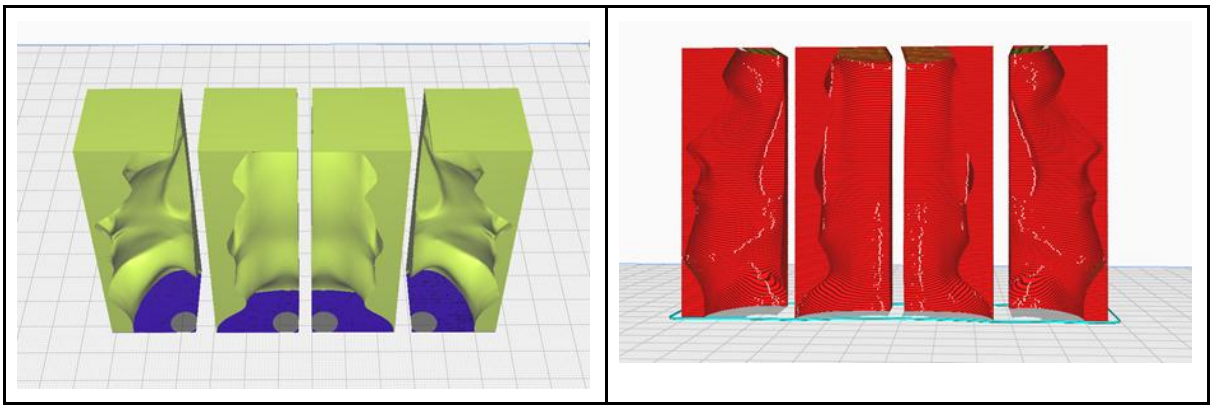
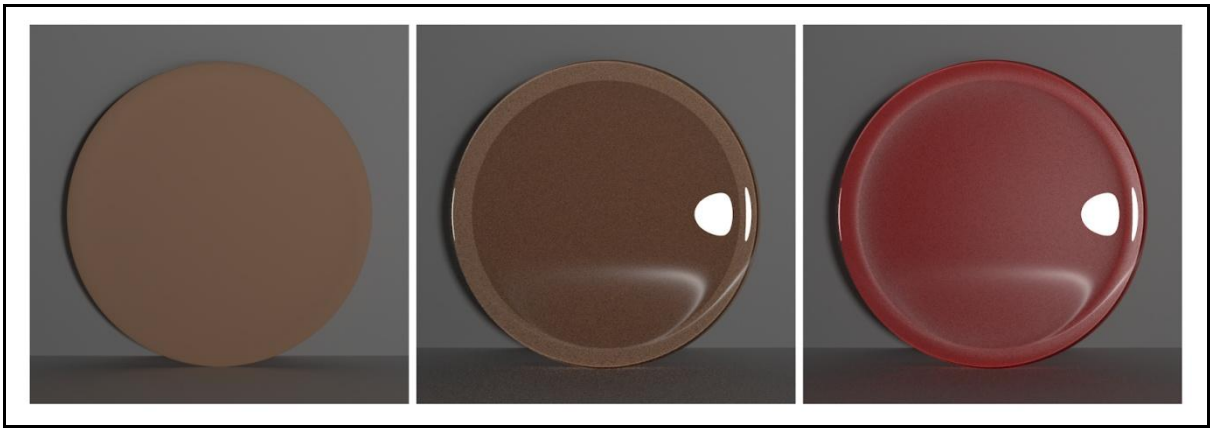


Figure 1. The final version of this module is available online, in the Community Portal.

4.1.2 Glazes

Part of the craft is the appearance of the intermediate and final product, potentially previewing it at the installation site and optimally during its creation. The visualisation toolbox is used to realistically predict the appearance of craft products from their designs or 3D models. This capability helps the product designer envisage the prospective creation before its implementation.



Similarly, an engraving simulator predicts the appearance of designs on metal sheets. The designs are shown in the top row, and the visualisation results are in the bottom.

Figure 2. Virtual engravings on metal.

4.1.3 Cane work

In glassworking, cane work refers to a technique involving the use of long, thin rods of glass, called “canes,” which are created by stretching molten glass into slender strands. When these canes are incorporated into the blown piece, they produce decorative effects. A cane-working simulator predicts the appearance of artefacts created from glass and metal canes, using nominal descriptions of the number of canes, their twisting, composition, and thickness. In the figure below, the appearance of cane work artefacts is predicted, created from glass and metal canes. The left and middle images show the same

design implemented with different stained-glass colours. The image on the right shows a composition of glass and metal.

Traditional stained-glass windows used the “came glasswork” process of joining cut pieces of stained glass. Copper foil is a versatile alternative to the traditionally used lead. To facilitate the design of stained-glass windows, a software utility was developed. Given a colour image, this utility creates the 3D models of the parts of a stained-glass composition, that is, the metallic framework and the glass pieces.

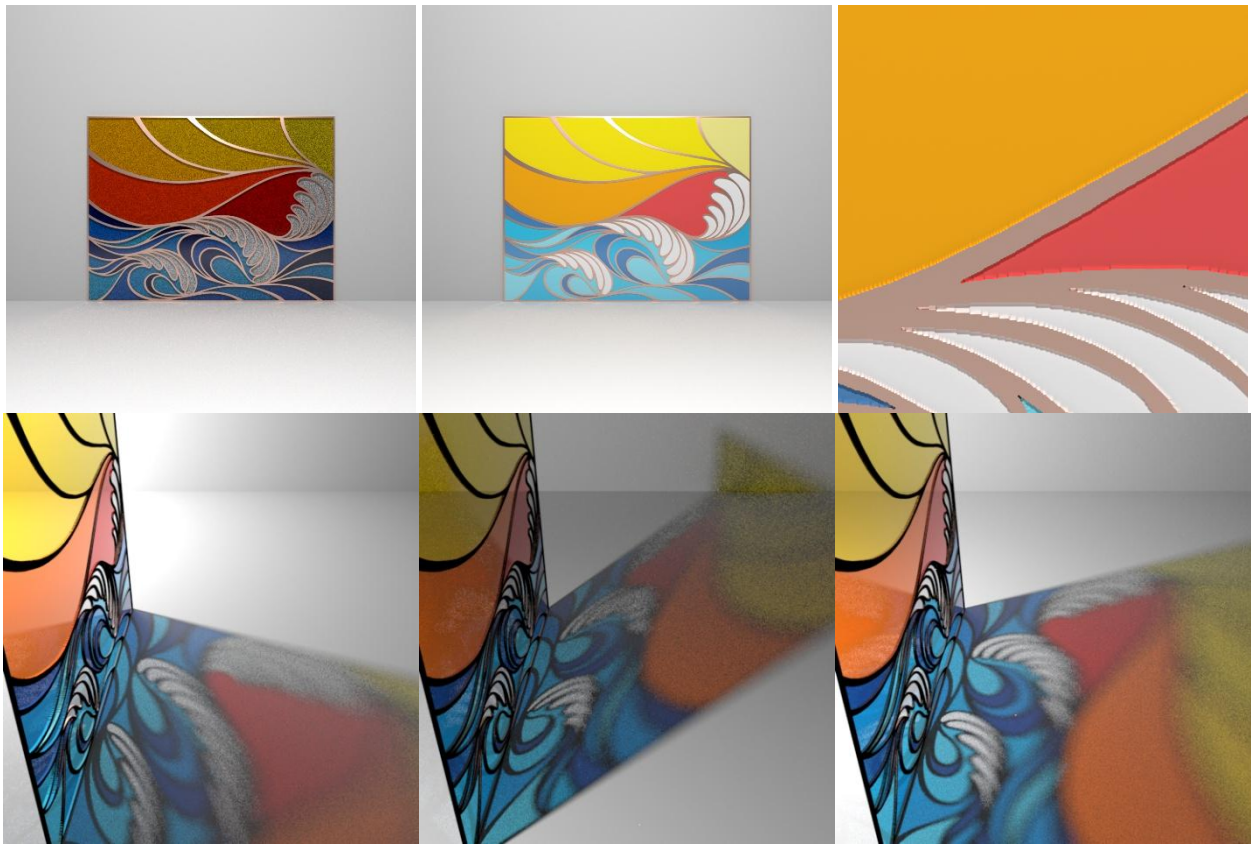


Figure 3. Original picture and stained-glass composition.

4.2 Motion

Initially, we digitised in 3D the plaster-throwing tools used in the process and represented them in the knowledge base. Then we recorded the process using an egocentric camera, capturing the practitioner's perspective and hand movements, and a scene overview, providing a stable external reference for workspace interactions. Using the recordings we reconstructed the practitioner's motion as a 3D avatar. Using event logs from the video data, we semi-automatically segmented the crafting process into elementary plaster-throwing actions. The extracted movements were semantically structured, linking each action to a functional role. The recording was registered as an event in the knowledge base and the digital assets from the session were linked to it and made available online through Web browser access for review. This includes the 3D models and the synchronised audio-visual recordings. In Figure 4, shown is the registration of the recording event in the knowledge base (left), the list of recorded actions (middle), and the collection of video segments (right).

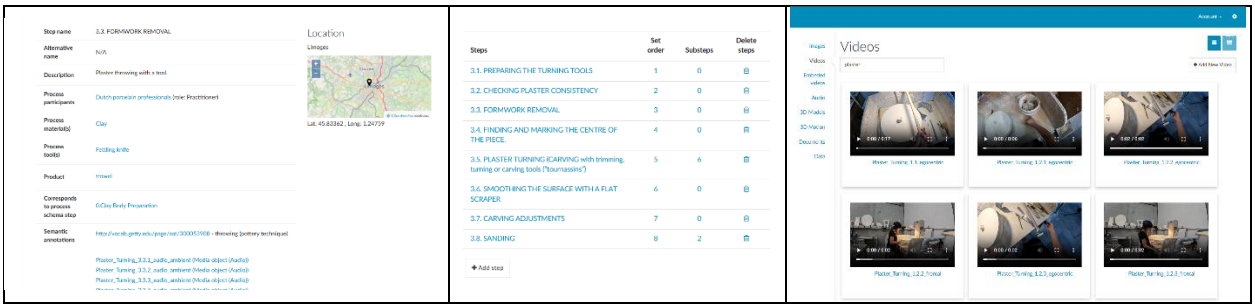


Figure 4. Event registration (left), action collection (middle), and recordings preview (right).

Following the workshop findings, our study focused on tools and body posture during the actions. The motion-extracted 3D avatar effectively captured the hand and body movements aligning with real-world observations. Including 3D-scanned tools enhanced the accuracy of tool-material interactions, enabling a more faithful simulation of practitioner techniques. Deviations are observed in fine-scale, due to the complexity of modelling material behaviour. The simulation provided a meaningful approximation but would benefit from more advanced material calibration and experimental validation through high-speed imaging.

An interactive physics-based application of the plaster-throwing provides an introduction to the craft and workshop. The tools models and the motion data guide the virtual throwing dynamics, allowing for real-time exploration of tool-material interactions. Key components of the application include (a) 3D-integrated plaster throwing tools, (b) gravity, inertia, and real-world dynamics constraints, and (c) real-time interaction to practice with throwing speed and tool angles. In Figure 5, shown are two views from the overview and worn camera (left column, top and bottom, respectively). The rest of the columns show the reconstruction of body posture (top) and tool manipulation (bottom) in simulation.

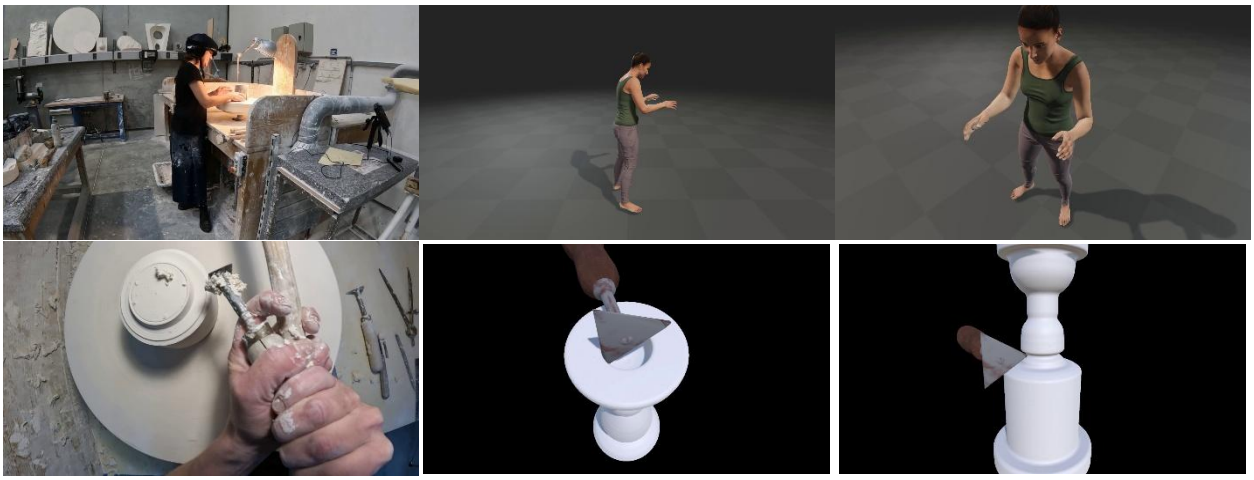


Figure 5. Ethnographic videos of plaster throwing (left) and virtual reenactment (middle, right).

4.3 Additive and subtractive manufacturing

The RevolutionSolid Unity integration project achieved significant milestones in its second year, focusing on robust toolset development and usability. A core accomplishment was implementing the RevolutionSolid.dll native plugin, which enables real-time solid manipulation, supported by the x64 Visual C++ 2019 runtime dependency. The architecture integrates critical components like the Generator class for mesh logic, OrbitCamera for editor navigation, and custom HDRP-compatible shaders (e.g., Triplanar Shader) to ensure visual fidelity.

The workflow emphasises simplicity, with a guided process for importing assets into new projects and configuring interactive tool spheres (subtractive, additive, mass-preserving). Challenges such as HDRP shader incompatibilities (resolved via material conversion) and native plugin dependencies were systematically addressed. Documentation was expanded to include code comments, API references (doc/index.html)

Overall, the task delivered a functional, scalable toolkit for dynamic solid editing in Unity, balancing performance, user accessibility, and adaptability to diverse rendering pipelines. Future efforts will prioritise VR integration and performance optimisations.

5. Use Cases for Each RCI

The Design Pilot highlights the intersection of traditional craft and contemporary technological innovation through design practices. These efforts focus on reimagining heritage crafts through experimental design approaches integrating advanced tools, materials, and interactive techniques. The following case studies illustrate how this methodology has been applied across various fields, showcasing the versatility and relevance of artisanal practices in addressing modern design challenges. Each use case explores a unique combination of materials, techniques, and technologies, offering valuable insights into the evolving relationship between craft, design, and innovation.

The progressive development of the Design Pilot has focused, in its initial phase, and an exhaustive manner, on the two case studies related to Limoges Porcelain and Aubusson Tapestry. This strategy has allowed us to test the methodological perspectives and guidelines defined in the Pilot. In particular, the conception and initial implementation of the Porcelain Design Pilot has served as a critical testing ground for adjusting its collaborative, logistical and methodological framework. By applying the principles of the Design Pilot in a real context, valuable insights have been gained into the effectiveness and adaptability of the proposed methodologies. The knowledge gained from the implementation of this phase, including the challenges encountered and the solutions devised, will serve as the basis for the continuous evolution of the Pilot and its rigorous application in the specific context of each RCI.

5.1 Case Study 1: CNAM / Porcelain and the “Ghost Gesture” Design Studio

5.1.1 Pilot Methodological Implementation in the ENSAD Limoges Context

The Design Pilot opens with a Case Study on Limoges Porcelain that spans a series of interconnected initiatives tailored to the unique context of the ENSAD School of Art and Design in Limoges. By applying the pilot's approach to this framework, the aim is to highlight several key dimensions that define its distinctive character: the dual emphasis on artistic and design-based principles at the core of its pedagogy, its commitment to experimentation, its human and social dynamics, its ethos of collaboration, its historical and heritage significance, and its connections with local industries. This Design Studio project was set up in the school's 1000m2 ceramics workshop, which is divided into two complementary areas. The porcelain area functions like a small manufacturer, integrating all stages of production, from moulding to glazing, with specially adapted equipment such as electric and gas kilns. A second area is dedicated to non-porcelain clays, allowing for modelling, sculpture and throwing and the workshop also includes a decoration and oxide laboratory. Teachers can help students to think about production as designers. Designers stop at the plan for their object, and then the manufacturer or craftsperson makes it. At ENSAD Limoges, through the design project, students learn the technical gestures that enable them to understand all the stages in craft and industrial production: model, mould, casting, stamping, firing, enamelling and decorating.

This case study is based on a collaborative process with Anne Xiradakis and Jessie Derogy, object-oriented designers and ceramics teachers at ENSAD-Limoges. With very different practices, their research-based

design work draws on traditional porcelain and ceramic production techniques, from a contemporary perspective. Both designers share an interest in the gestural aspects of craft-making, and a great awareness towards the materiality of the objects they produce while integrating a reflection on technique into their practices. This collaborative process was thoughtfully conceived based on the methodological guiding principles established for the Design Pilot. This perspective seeks to emphasise open dialogue, highlight interdisciplinary experience and enable collective reflection on digital tools and resources. Structured in several phases, this methodological approach includes a crucial stage whose objective is to understand, in a precise manner, the interests and needs of the collaborating designers, stressing the importance of exchange and active listening. This preliminary research stage aims at the principles, techniques, values, and traditions interwoven in design practices. It consisted of a series of exchanges and unstructured interviews with the designers that allowed for in-depth research into these issues, and carrying out organisational and coordination tasks. The researchers introduced the CRAEFT project and explored the designers' interests in the project objectives and the orientation of the design pilot. A clear and practical framework for collaboration was also defined, by the logistical and material context of the school, addressing the institutional, curricular and pedagogical limitations inherent in working in the school environment. The needs and requirements of the designers were considered to ensure the effective development of the collaborative framework.

Based on this preliminary assessment, a thematic line was defined, focusing on the gestures involved in porcelain production. This second phase revolved around the co-creation and collective reflection on a series of tailor-made digital tools. These digital tools were conceived to draw attention to the gestural dimension of porcelain techniques and facilitate analysis by creating a certain distance from the material dimensions and the tools during the production process. Taking as a starting point the video files resulting from the application of the ethnographic protocol and the recording sessions that took place in the school's ceramics workshop a few months earlier, it was decided to choose a specific sequence of the process of making a piece of porcelain. The idea was to concentrate on the gestures associated with plaster turning.

5.1.2 “Ghost Gesture” Design Workshop

Workshop Approach, Format and Structure

With these reflections as a point of departure, the designers devised a flexible workshop format to continue exploring these issues and, at the same time, to test the series of digital tools developed with the participation of a group of students. The initiative sought to establish a dialogue between the traditional practices of porcelain production and emerging digital technologies, using gestures as a bridge between tradition and innovation.

Drawing inspiration from the ‘ghost gesture’, a term associated with motion capture technology, the designers focus on often-overlooked gestural, postural and bodily dimensions of porcelain know-how. Although the notion of ghost gesture is often associated with the idea of residual gesture, how it is evoked in the project has more to do with the exercise of abstracting a technical gesture of a craftsperson about the tools they use and the materials they work with.

Based on this thematic orientation, and translating the interests of the designers, the researchers asked FORTH to develop a series of personalised digital tools adapted to the specific needs of the workshop. Using the videos recorded with both an egocentric camera and a front camera during the protocol

application, focusing on a sequence of great technical complexity, the plaster turning, it was decided to work from different gestural representations of the same action. This phase, which requires great dexterity in the handling of the turning tools (*tournassins*) on the material in constant transformation — the plaster changes consistency and dries out during this process — served as a vantage point for observing, describing and analysing the technicality of the gestures involved. A series of experimental tools was developed by FORTH to represent these gestures through various digital media, including:

- **Avatars 3D**, which offered a visual and dynamic embodiment of the gestures, translating and simplifying the movements of the practitioner
- **Hand tracking** captures the precise movements of the artisan's hands, generating a pattern that geometrises the particular structure of the practitioner's body.
- **Skeleton-based view** which, based on the frontal video recording of the technical action, translated the moving posture and body schema of the practitioner, allowing a more analytical perspective of the movements.

As a counterpoint to this series, a fourth tool was added to complete the series, the **Porcelain Generator**, which allowed for a simulation of the work of plaster turning, precisely without showing the gestures that allow for the use of tools and their effect on the material.

Through this multimodal approach and in line with the experimental nature of the tools, the workshop format was constructed with a flexible perspective that sought to combine phases of analysis, documentation, guided practice, and free practice alternating with the use of digital media and experimentation with materials present in the ceramics workshop.

Aimed at a group of a maximum of 10 students at the school, the workshop was included within a pre-existing pedagogical device at the school, The Ceramic Studio, which is characterised by the dimension of exploration, discovery and creative research into ceramic practice. The workshop was organised over four consecutive days, allowing for an in-depth and consistent exploration of its methodological and thematic perspective. The pedagogical programme was organised into three working groups, each on focusing on one of the tools.

The workshop’s goal was threefold: to visualise the gestures involved in porcelain making, to enhance the transmission of posture and movement techniques for teaching purposes, and to encourage innovation in porcelain design through digital tools.

Figure 6. Ghost Gestures Workshop, ENSAD Limoges, Ceramic Studio (2024). (Image: Inés Moreno).

Workshop Development and Implementation

The Limoges Porcelain Design Pilot Workshop held at ENSAD Limoges from 5 to 8 November 2024 involved two CNAM researchers, the two designers who led and co-facilitated the workshop, and 9 participating students.

Over four days, the workshop was attended by first- and second-year design and art students, who were introduced to the general lines of research of the Craeft Project and the specific theme, focus and structure of the workshop. After this introduction, they were presented with the set of experimental digital tools developed by FORTH and had to choose which one they wanted to work on during the workshop. Each working group, formed by three students, chose one of the digital tools (3D avatar, hand tracking and skeleton-based view). It was decided that the Porcelain Generator would be excluded from this initial phase to allow students to focus specifically on gesture-oriented tools. This hands-on workshop focused on exploring the traditional gestures in manufacturing a piece of porcelain. The aim is to develop production scenarios, imagining and materialising new tools, objects and gestures through different media. The workshop programme unfolded as follows:

1-day:

- Introduction Phase: Presentation of the research project, the workshop approach and the set of digital tools.
- Tool Selection Phase: Each working group chose a digital tool to work with during the workshop.

- Analysis Phase: The first task is to observe the gesture associated with the selected tool. Each group took the time to analyse what is visible in the gesture, what remains unseen, and what can be imagined about its execution.
- Reproduction Phase: The students reproduced the gesture, trying to embody and memorise it, to deepen their understanding.

2-day:

- Extraction Phase: The students tried to remove the gesture from its original context to examine it with a fresh eye.
- Translation Phase I: The students attempted to translate the gesture into a different medium, without using tools, focusing on applying the gesture and recreating a form using various materials related to ceramics: reproducing the gesture using clay to create a form and repeating the process with plaster, exploring different stages of the material.

3-day:

- Translation Phase II: The students continued to reproduce the gestures on other materials, using tools present in the ceramics workshop.
- Translation Phase III: The students sought similar gestures in other work fields or everyday activities and documented this research through various media (video, photo, drawing). The goal was to find parallels between the movements and identify their applications outside ceramics.
- Performance Insight Phase: The students were shown excerpts from the audiovisual documentation of the performance *Made in China* by Fabrice Mazliah (2019) a choreography based on the interaction between a dancer and a piece of porcelain, based on the piece's affordances and its associated gestures of use.

4-day:

- Dual Experimentation Phase: The students were able to directly explore the technique of turning plaster using traditional tools and to discover the possibilities of its simulated version, the Porcelain Generator, and compare both experiences.
- Assessment phase: The workshop concluded with a group discussion in which the students reflected on their experience during the workshop, sharing insights into how they analysed, interpreted and experimented with the gestures, materials and ideas proposed.

The students were asked to document each stage of the workshop in groups and elaborate a written summary of their reflections with a compilation of the materials produced.

The workshop encouraged students to combine physical and digital methods, engaging in a process that combined gesture analysis with material manipulation. The methodology emphasised a collaborative approach and the pedagogical framework integrated both traditional and modern design approaches. Through a combination of 3D avatars, hand tracking, skeleton-based views and a Porcelain simulator, participants explored these movements in digital form and applied their insights to hands-on work experimentations with clay and plaster.

Figure 7. Ghost Gestures Workshop, ENSAD Limoges, Ceramic Studio (2024) (Image: Inés Moreno).

Workshop Reflective Assessment

In the last part of the workshop, an evaluation was carried out with the students to assess their experiences and, above all, to attest to the effectiveness of the tools and methodologies.

The 3D plaster lathe simulator was appreciated for its innovative potential to visualise forms, although participants considered that the tool could benefit from a more intuitive interface and greater immersion. The students who combined the simulator experience with trying out work on the traditional lathe reported a richer and more complete experience. Some comments revealed that the time spent on analysis sometimes interrupted the flow of practical experimentation. Many students expressed a desire for more direct interaction with the materials, as this would enable them to connect theory with practice. Suggestions for improvement included incorporating gloves to enhance the sensory experience of digital tools. The evaluation highlighted the potential of a video documentation and archiving platform to support distance learning. The students considered the platform a useful educational tool, providing easy access to learning content and allowing them to review techniques and concepts away from the workshop. These comments reflected a continued willingness to bring digital tools into dialogue with traditional craftsmanship, creating new platforms of experience and development to improve technical learning and foster student creativity.

The workshop successfully demonstrated the potential of digital technologies to enrich the porcelain manufacturing process, combining the experience of traditional craftsmanship with the possibilities of contemporary design. Despite the challenges encountered in using the tools, the participants left the

workshop with a greater understanding of gesture analysis and material manipulation. The exchanges will calibrate the methodological device, to integrate the analysis and material experimentation.

The insights gathered during the workshop will serve as a basis for future improvements in digital tools. Integrating these tools in the context of traditional porcelain production space affords interesting possibilities for innovation, offering a new way to engage with craft-making while opening up new avenues for ceramic-based contemporary design practices.

5.1.3. Focusing on Gesture as a Medium and Tool for Innovation

Within the framework of CRAEFT and in line with the research orientation of the ethnographic protocol, gesture, skill and, in general, the embodied dimension of know-how is at the core of the Design Pilot in the Case Study focused on Limoges Porcelain. Despite its elusive nature, the know-how dimension is important when striving to deepen understanding and improve the transmission of craft knowledge.

The designers' participation in the Pilot was partly driven by their shared interest in the gestural dimension of know-how, as a tool for analysing technical action, a vector for transmission and a source of creative exploration within the design field. The role of one of the designers, Jessie Derogy, who is also the pedagogical coordinator of the ceramics workshop, was instrumental in the choice of the representative gestures of porcelain production in the specific context of Limoges, which were documented and studied by the Consortium. One of the specificities of the traditional craft-making of porcelain in Limoges relies precisely on the plaster turning on the wheel. Although this sequence was documented in detail during the protocol application, the designers considered it necessary to delve deeper into its complex technicality and, specifically, into the gestural and bodily expertise that it involves. It was decided to construct the Porcelain Design Pilot, in its dual aspect of pedagogy and design research, based on this sequence of gestures that are highly conditioned by the use of two types of tools: a wooden stick (*pictured*) to stabilise the movement in combination with a range of turning tools (*tournassins*). The designers' research orientation was to distance themselves from the determinism of traditional tools and material constraints and focus on the production gestures. One of the designers involved, Anne Xiradakis, had developed several projects explicitly integrating the gestures of use in her object design process. In this sense, the Pilot approach was an extension of this perspective, focusing on the particularities of production gestures and their significant potential as a tool and source of innovation in contemporary design practices. By focusing on gestures, the Pilot approach seeks to redefine innovation in craft-oriented design practices through the dialogue between traditional porcelain making and digital technologies. Along with the documentation produced during the application of the ethnographic protocol, these digital tools not only preserve knowledge of craft techniques but also deepen our understanding by revealing dimensions of the practice that are not easily perceptible to the naked eye, even for its practitioners. While the workshop format allowed for a guided accompaniment towards a more precise awareness of the crucial role of gestures within a technical process, the designers delved deeper into the idea of the gestural dimension of traditional know-how augmented through digital tools, as a means of enabling innovation and the exploration of new forms of transmission, creation and expression.

5.1.4 A Collaborative Approach to Digital Tool Development

The Collaborative Development Process

The Pilot's perspective is integrated into the methodological approach of the CRAEFT project and its commitment to interdisciplinarity as a mode of understanding and conducting research. In the same way that the protocol developed in the project involves the convergence of various disciplinary traditions in the social sciences and crucial contributions from research in computational sciences, the integration of design is conceived in similar terms. The framework was guided by social science researchers, based on the specificity of the practices, methods and professional values of object design as a discipline. One of the objectives of this collaborative framework was to address different ways of understanding technical gestures based on different disciplinary traditions that mutually enrich one another. The initiative developed in the context of ENSAD in Limoges reveals how digital technologies can be rethought and fruitfully combined with traditional skills to improve the design process, refine teaching methods and unlock new possibilities for creative exploration.

At the centre of this Pilot's perspective lies the willingness to explore the possibilities of the successful development of digital tools that arise from the collaborative conversation between researchers, artisans, designers and technological developers. At ENSAD Limoges, the development of digital tools was a collaborative endeavour, led by the designers alongside researchers and students. This process took place in several phases and had to deal with certain challenges, especially the predictable mismatches that arise when different cultures and professional visions engage in open dialogue. In the same vein, another critical aspect was the task of social science researchers to understand the prospective needs of designers, translate these requirements, and communicate them clearly to the technology partners. The latter, for their part, had to adapt existing technologies to meet the designers' needs and interests. This resulted in translation and interdisciplinary readjustment, which were overcome thanks to constant listening and the necessary doses of mutual adaptation and flexibility.

Experimental Testing

The experimental testing and analysis phase of digital tools was carried out at various levels. During the first presentation at a meeting before the workshop, the designers discovered how their proposals in tool conception had been interpreted and materialised. One of the main objectives of this tool co-creation phase was to develop a series of different modalities of gestural representation that would allow different analytical perspectives to be deployed and compared concerning the chosen manufacturing sequence. In this sense, the tools developed and proposed by FORTH met the designers' expectations in their variety and multiplicity of points of view. Some of the designers' requirements were unmet, such as the complete abstraction of skeleton-based eye-tracking or hand-tracking by eliminating the background from the original video. This aspect did not prevent the experimentation and testing stage. Although still in the early stages of technological development, the proposed tools aroused great interest and some surprise among the designers, who rediscovered traditional porcelain techniques in a new light. A key feature of the experimental testing was its emphasis on iterative refinement.

On the one hand, the experimentation and testing of the series of tools was carried out individually by each designer, with the dual objective of generating recommendations for the improvement of the tools and developing a reflection on the place of this type of tool within their research, creation and production processes in design. This phase also allowed them to choose a particular tool that they found interesting from a technical, pedagogical or creative point of view. By focusing on one tool, they could carry out a more detailed and in-depth analysis, make more precise and accurate recommendations and be able to imagine innovative design projects. On the other hand, the workshop was conceived to implement,

reinforce, and diversify the testing and analysis phase of the toolkit by the participating students to verify its potential as a means of learning and formal experimentation. The workshop format by thematic groups allowed for the structuring of the different angles of experimentation and the channelling of the students' collective experiences. During the workshop's testing sessions, participants provided valuable feedback on the usability and functionality of the tools. Initial tests revealed both strengths and weaknesses in the design of the tools. While the digital tools were useful for visualising and analysing the gestures, the students found that direct interaction with the materials was essential for deepening their understanding of the movements.

Analysis of Findings

The experimental testing phase provided crucial insights into how digital tools could enhance porcelain-making, offering new perspectives on this traditional craft-making. This testing phase also revealed that the tool's analysis was most effective and engaging for the participants when combined with hands-on experimentation. Each tool provided a detailed visualisation of the subtleties of the gestures involved in turning plaster, revealing the precision and dexterity required by the process. Their analysis allowed the designers and students to observe these specific gestures in new ways, including the sense of unfamiliarity that analytical distance provides.

The designers tested the digital tools were tested. The students participated in the workshop and in the early stages of development. The feedback and recommendations included here refer to the first version of these tools. Since then, these tools, especially avatar representation, have been considerably improved.

Tool 1: Insights and Challenges in Avatar-Based Representation of Gestures

Figure 8. Avatar representation based on Plaster Turning gestures (image: FORTH).

The representation of the plaster turning gestures using an avatar has been developed from an interpretation of the technical action using as a source the videos recorded with a front camera during the application of the protocol. Eliminating the workshop space, the tools and the materials, this mode of representation seeks to focus on the gestures, postures and bodily behaviour of the practitioner during the execution of the action. This type of avatar is interesting to practitioners who discover another way of visualising a technical sequence, but it presents some challenges and leaves room for further improvements.

Early Feedback and Recommendations from Designers and Design Students

- Point of view and visibility: One of the problems lies in the point of view. In particular, the visibility of the hands is often obstructed by the position of the arms, which causes the gestures to be partially or hidden. This limitation highlights the need for an avatar that allows for dynamic manipulation of perspective, such as rotational views, to improve clarity.
- Rhythmic and movement constraints: The fluidity and coherence of the gestures are interrupted by a 'choppy' rhythm, making it difficult for observers to follow or interpret the sequences with precision. The quality of the representation of the movement could be improved to give an impression of continuity and fluidity. The avatar's movements are perceived as sluggish, reducing the fluidity and realism of gesture representation. Enhancing the responsiveness and naturality of movements could significantly improve user perception.
- Length and sequential limitations: The brevity of the sequences exacerbates the aforementioned challenges, as it limits the amount of information provided.
- Identification Challenges: abstraction from the context makes it difficult to recognise the specific production sequence that served as the source for developing the avatar. The cold and inhuman aspect of the avatar can limit the connection of users who have difficulties recognising their gestures in the avatar, making it difficult to identify with it. The spasmodic nature of the movements creates a sense of distance from the user's actual practice.
- Increasing Self-awareness and reflections on Practitioner Bodily Behaviour: The avatar provides a unique perspective, revealing that users are often more static during shooting than they perceive themselves to be. This feedback can be valuable for self-reflection and improving practices.
- Contextual Abstraction: The avatar's lack of contextual elements, such as tools or materials, provides a unique perspective emphasising gesture and posture. This abstraction encourages gesture-focused analysis, which can be valuable for specific analytical or creative applications. While this approach offers new possibilities, its practical utility depends on translating these insights into actionable design elements.

Suggestions for Refinement

- Simultaneous Display of Multiple Videos: To facilitate an exhaustive analysis of the gestures from multiple perspectives, a dual-view interface will be implemented. This interface will show two avatars representing the egocentric and frontal perspectives, side by side on the same screen. Ensuring precise synchronisation between the videos will allow for perfect comparative analysis of the movements from both points of view. Priority will be given to a fluid and uninterrupted representation to improve the observer's ability to effectively grasp the dynamics of movement.
- Improved Point of View Options: To provide a more immersive and comprehensive gesture analysis experience, a visualisation system will be developed in which users can dynamically adjust their point

of view by rotating perspectives or zooming in on specific areas of interest. Close-up view options will be incorporated to improve the visibility of critical gestures or actions. Users manipulate the avatar, viewing the movements from any angle to better understand gestural dynamics.

Tool 2: Hand-Tracking Visualisation Mode of Plaster Turning Processes + Real-Time Hand and Body Schema Tracking

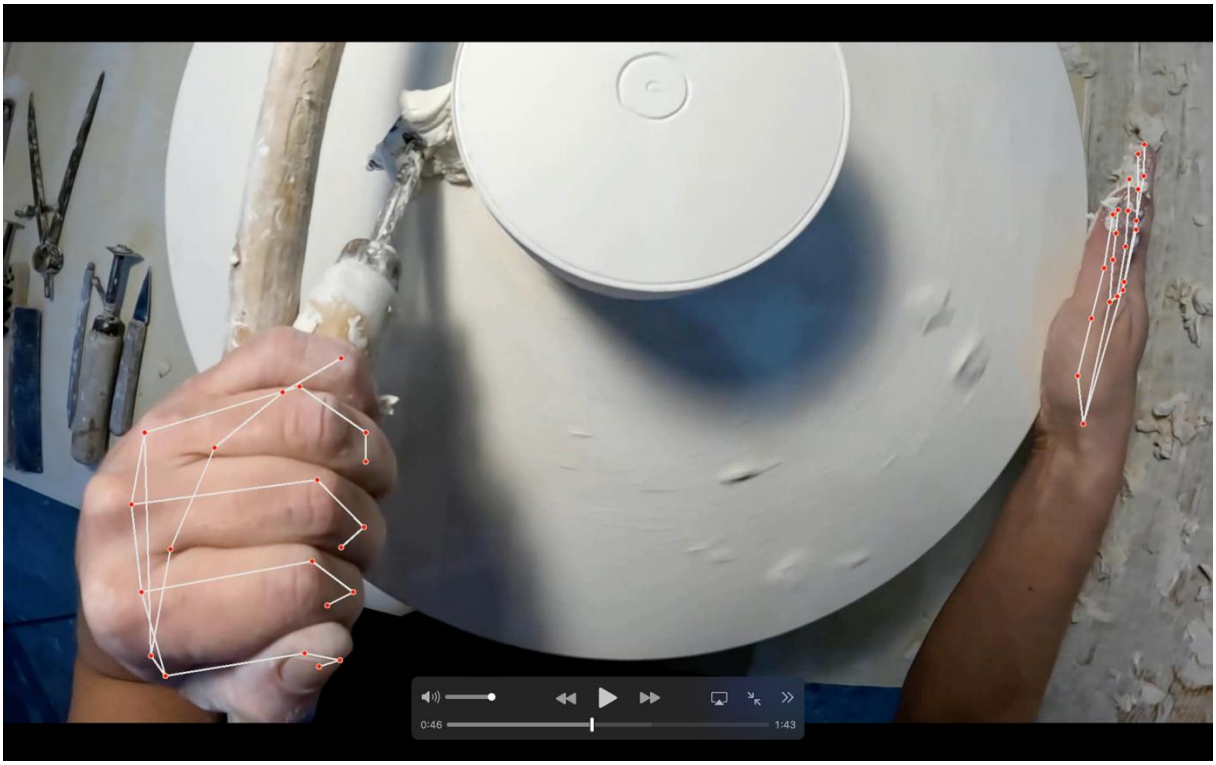


Figure 9. Hand-tracking of Plaster Turning representation (image: FORTH).

The hand tracking visualisation mode aims to capture and represent the intricate hand movements involved in craft processes, plaster turning, in this case, translating them into a digital or visual outline. By tracking the hand and body in real-time, this mode highlights the complex relationship between gestures, tools and the transformation of the material. The system maps the positions of the hand, the joint angles and the body posture during the turning process, providing an interactive view of the crafting process.

Early Feedback and Recommendations from Designers and Design Students

- Precision of Gestures: the mode effectively captures the fluidity and complexity of hand movements, making complex gestures more understandable.
- Geometrisation: the schematisation of movements provides an interesting way of studying gestures, emphasising their relationship with tools and materials.
- Visual Clarity: the visualisation highlights the angles of the joints and the positions of the fingers, which helps to dissect the subtleties of the craft.

- Movement Continuity: at times when visibility is limited (for example, when parts of the hand are obscured), the system seems to 'guess' the movements, which introduces inconsistencies in the representation.

Tool 3: Skeleton-Based Gestural Representation

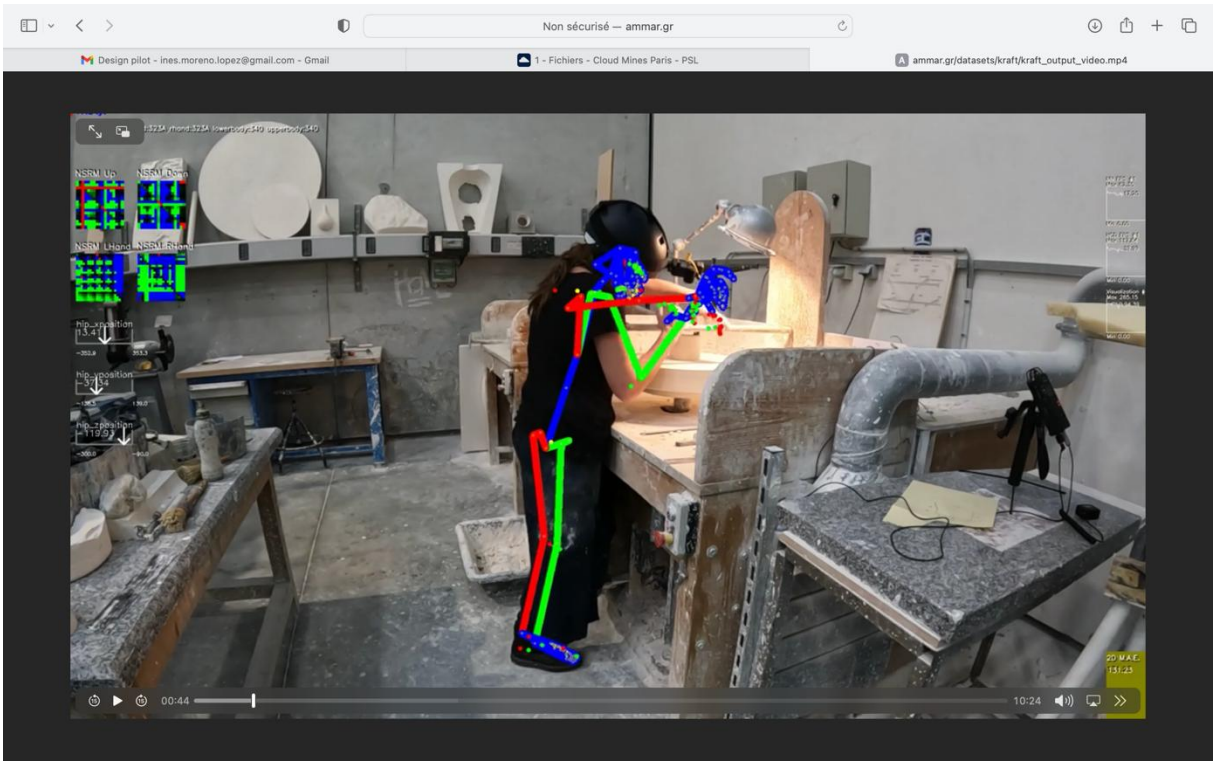


Figure 10. Skeleton-Based Gestural Representation (image: FORTH).

Early Feedback and Recommendations from Designers and Design Students

- Lack of Realism: The gestures, particularly the movements of the fingers, feel surreal, almost detached from actual practice. Issues of proportion arise, such as the size discrepancy between the hands. For example, the hand in the foreground appears unnaturally large about the other
- Interpretation Challenges: There are difficulties in understanding the depicted action, partly due to visibility problems, such as the relationship between the front and back elements or the perceived distances.
- Technical Considerations: When visibility is obscured, there's an impression of improvisation, as though the gestures are imagined rather than precise. This imaginative quality introduces ambiguity.
- Perception Issues: The representation of the system of lines and points creates confusion in the understanding of the position

Suggestions for Refinement

- Face Abstraction: The face should be rendered as abstract as possible, focusing less on its details and more on the position of the head about the body.

- Improving clarity: It is essential to accurately represent the position of the limbs and the flow of gestures to eliminate ambiguities and ensure movement consistency.

Tool 4: Porcelain Generator

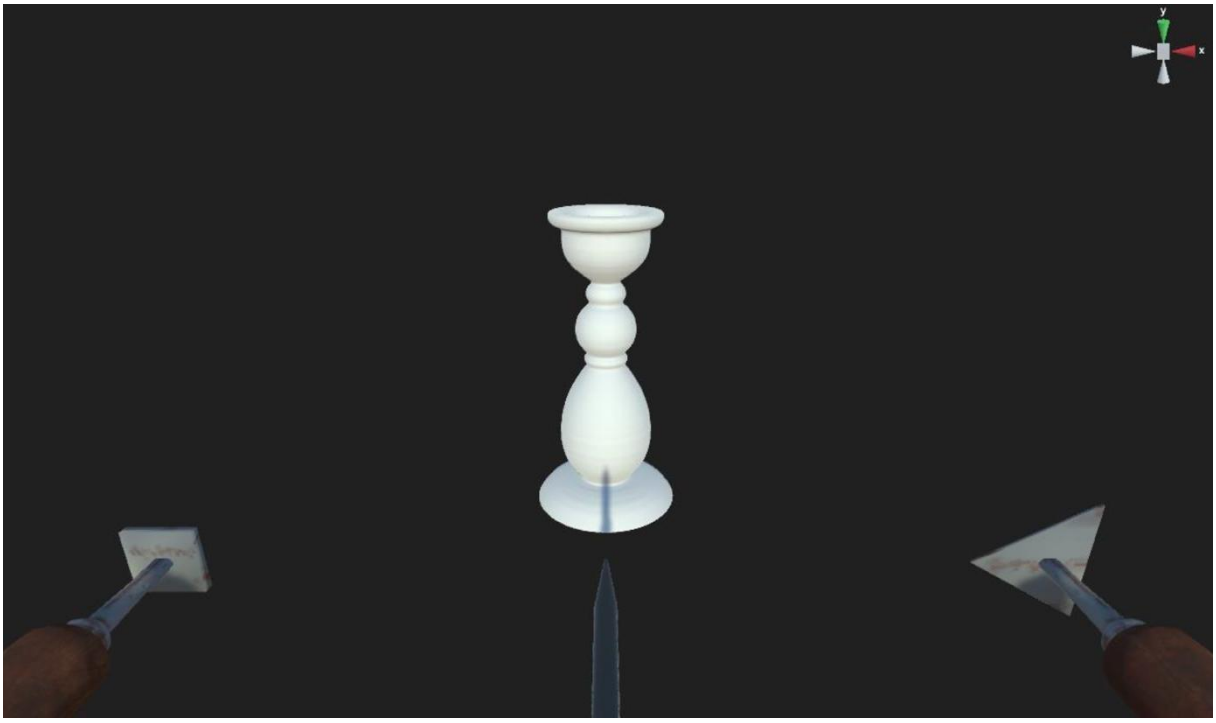


Figure 11. Porcelain Generator (image: FORTH).

This digital device is a Plaster simulator that allows the user to reproduce the plaster turning process with two types of tools: different turning tools (*tournassins*) to remove material and a tip tool to mark reference points. The gestures are not represented, allowing the users to put themselves in the maker's position. During the workshop, this digital tool was introduced second but was the subject of a more detailed analysis.

Early Feedback and Recommendations from Designers and Design Students

These recommendations are intended to make the Porcelain Generator more realistic, ergonomic and accessible while promoting an immersive experience faithful to the real porcelain-making process.

Visual dynamics and perception of movement

- Challenge: The object rotates so perfectly that the rotational movement is not perceptible, giving a static impression.
- Recommendation: Introduce a subtle visual effect (for example, a slight texture or a visible mark on the surface) that allows the user to perceive the rotation in real time. This could also reinforce the handmade feeling.

Note: It must be remembered that when the plaster is poured onto the work form on the wheel for modelling by turning, the cylinder is never a perfect solid of revolution. Consequently, modelling on the wheel always starts with an irregular cylinder.

Noise and sound interaction

- Challenge: The tool does not generate a sound when the plaster is scraped or material is removed, interfering with immersion.
- Recommendation: Incorporate a sound component simulating the noise of material removal (scraping). This sound dimension would enrich the user experience and strengthen the link with actual craft practice. It could also heighten awareness of the materials used.

Unrealistic tool behaviour

- Challenge: The tool works even when it shouldn't, such as when used on its flat side instead of its cutting edge.
- Recommendation: Refine the tool's constraints to reflect its actual operation, limiting its effectiveness to conditions corresponding to realistic use. This would enhance the consistency and technical accuracy of the simulator.

Lack of base and gravity

- Challenge: The tool does not account for gravity, weight or mass, and there is no visible plinth or base to anchor the object in space.
- Recommendation: Add a base or anchor point to place the object in a spatial context. Simulating the effect of gravity could also prevent the creation of unrealistic shapes in real life and improve the credibility of the designs generated.

Note: It should be remembered that the plaster is poured onto the base of the plaster wheel which has a plaster piece in the centre (*quille*) that serves to hold the form on the wheel, to prevent it from detaching with the rotation and centrifugal force exerted.

Lack of spatial references

- Challenge: The simulator does not provide clear markers to measure the diameter, height or scale of the objects created, which makes it difficult to reproduce shapes and limits possibilities, such as creating a shape from a drawing.
- Recommendation: Integrate visual markers or measuring tools into the interface to enable users to assess the dimensions of their creations. This would make it easier to plan and document designs.

Ergonomics and handling problems

- Challenge: The transition between translation and rotation is not intuitive, and some keys do not work properly on an AZERTY keyboard, making the tool difficult to use for non-QWERTY users.
- Recommendation: Adapt the commands to take account of AZERTY keyboard configurations. For example, allow users to reconfigure keyboard shortcuts according to their preferences. Simplify the

transition between translation and rotation movements by integrating a combined command or automating part of this interaction.

User experience and overall interface

- Challenge: Some functions, such as Reset (Home), are unavailable or their operation is ambiguous.
- Recommendation: Check that all the advertised functions are functional and accompany them with clear indicators in the interface. A toolbar or drop-down menu could centralise the main options and make the experience more intuitive.

Visibility problem

- Challenge: the turning tools don't stand out very well against a black background
- Recommendation: Lighten the background and add chromatic elements that contrast the tools and the background surface or lighten the tools and make the metal parts appear shinier.

5.1.5 The Designer Gaze: Jessie Derogy Insights and Design Proposal

Beyond experimenting with and analysing the use of the digital tools proposed in the context of a ceramics workshop and the suggestions for improvement and refinement proposed, the designers also drew on their different design practices to develop some reflections on the use of digital tools and possible creative developments in the form of design projects.

Jessie Derogy (1993) defines herself as an experimental designer. She completed her studies in the Netherlands, graduating in 2017 with a Master of Arts in Contextual Design from the Design Academy of Eindhoven. Attracted by ceramics, in 2018 she joined the post-graduate course 'Art and Design in Contemporary Ceramics' at ENSAD Limoges. She currently lives and works in Limoges.

Figure 12. Jessie Derogy. Left: Magnum, vase, 45x30 cm, Biscuit and enamelled porcelain, black velvet flocking (2024). Right: Opus, salt mill, 20x8 cm, Biscuit porcelain, coloured by capillary action (2024).

Statement of Practice

Jessie Derogy is fascinated by existing forms, from objects to technical pieces and from architecture to scraps of material she collects and assembles. Like a thieving magpie, she intrudes on territories, hijacking existing objects to create new structures. She forms collages with abstract functions that she intuitively assembles into ritualised objects and scenes. She has developed a deep sensitivity to materials through her ongoing research into everyday objects (their form, meaning, design and use). It is through ceramics that she is now developing her practice. Fallen in love with the material and its manufacturing processes, she finds in her creative process all the elements necessary for her work. Somewhere between industry and craft, series and a single piece, each ceramic generates a set of elements revolving around the finished piece (mould, matrix, waste, failures, defects, firing support, etc.). These are all components that become part of his collages. Her practice is motivated by a critical approach to design (production, meaning, representation, aesthetics). Going beyond the formal conventions of object design allows her to explore and develop new narratives and aesthetics. The results of his practice oscillate between 'functional sculpture' and 'sculptural object', blurring the boundaries between art and design. As a result of her cross-disciplinary practice, she has taken part in several exhibitions dedicated to design in Europe and has been invited to group exhibitions of contemporary art. In 2022 and 2023, she won two consecutive awards (Mathias Prize) for her work in ceramics.

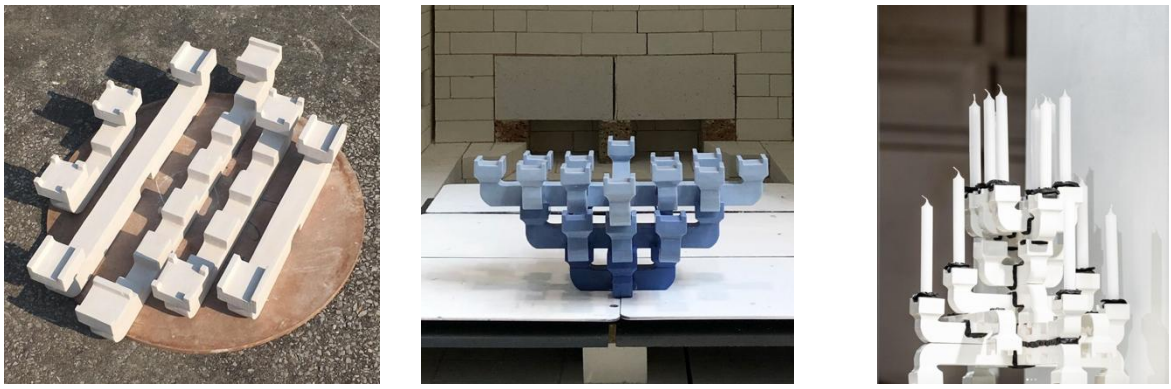


Figure 13. Jessie Derogy, Gradient Dougong (2021).

Artist link: https://www.instagram.com/jessiederogy/

Project Proposal based on Porcelain Generator

This project explores interactions between digital virtuosity and physical gesture in the context of creation using the digital tool Porcelain Generator. It combines control and the unexpected, as part of an exploratory approach aimed at the material qualities and the trace of gesture, while questioning the specificities of digital and traditional creation methods. The project is structured along three lines:

- The trace of the gesture: Exploring the links between the physical gesture (the movement of the mouse or the tool in the simulator) and its impact on the digital and physical form. How can these traces be transposed into ceramics?
- Material anomalies: Intentionally working with 'errors or misuses of the tool to generate new surfaces, textures or forms.
- Contextual analysis of generated forms: Approach generated forms as objects of study, analysing them to give them meaning, context or function.

Using the Porcelain Generator reveals an immediate virtuosity: with just a few gestures, it generates complex, plastic forms that, in a craft context, would require years of mastery. However, this apparent mastery is accompanied by an absence of direct physical gestures and material interaction. In traditional ceramics, the handmade gesture leaves a tangible imprint, reflecting a dialogue between the hand, the tool and the material. This research looks at the intersection of these two worlds: what happens to the trace of the gesture when digital technology comes into play? How can we transpose this trace into physical matter, while respecting or subverting the specific features of the two modes of creation?

Simulation also offers a unique opportunity to play with digital anomalies, using them in a diverted way. For example, when the tool is not used on its cutting edge but on its flat surface, it does not interact with the material as it would in a physical context. This diversion creates unexpected results and new material qualities and questions the relationship between the form generated and its surface appearance. This project proposes to study these anomalies through a comparative approach: what happens when these

digital forms are translated into physical ceramic material? Surfacing work, for example, could be one route where the deliberate mishandling of the tool gives rise to textures or finishes.

The Porcelain Generator allows you to create shapes quickly, almost randomly, without necessarily responding to a prior intention. Unlike a traditional design approach, where the form results from a need, problem or context, here, form precedes thought. It becomes an independent entity, almost like an archaeological object whose origins, context and raison d'être need analysis. By taking these generated forms as a starting point, we reverse the traditional process: to reflect a posteriori on their meaning, contextual belonging, or potential function. How can we give them a reason for existing? This work invites critical reflection on the genesis of objects and their place in the contemporary world.

This project aims to blur the boundaries between the digital and the physical, between algorithm and gesture, and between chance and control. The dialogue between the two tools questions what these interactions reveal about the design practice. How can digital technology enrich ceramic craft and, conversely, how can craft inspire new digital approaches? Finally, what does this hybridisation tell us about the place and significance of objects in our societies today?

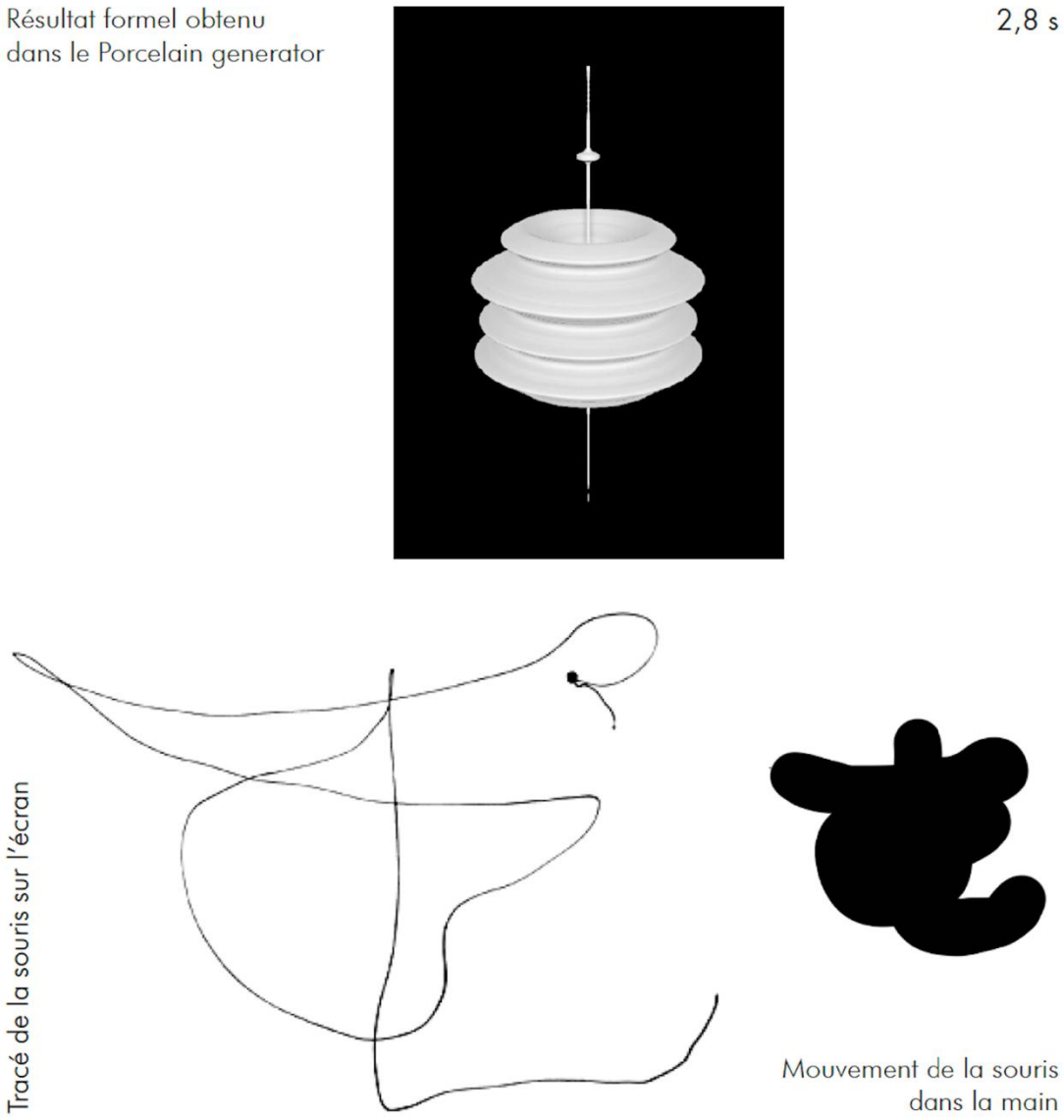


Figure 14. Jessie Derogy, Working Materials (2025).

Reflections on digital tools use within design conception and production process

In my approach, digital tools occupy an ambivalent position. They are not just practical instruments for carrying out specific tasks, but sometimes 'raw materials' for reflection. Take the Porcelain Generator, for example, this tool acts more as a catalyst for shapes and ideas than as a production tool in the traditional sense. Its ability to generate shapes quickly and instinctively, without reference points such as height or diameter, makes it a conceptual support rather than a means of producing a final object. In this way, the digital tool becomes a space for experimentation, where the usual constraints are deliberately absent. This 'open' and fluid character transforms these tools into a fertile ground for exploring ideas without

being limited by physical or technical imperatives. They are not seen as strictly technical instruments, but as an extension of creative thinking, sometimes even as malleable material to be shaped.

The importance of digital tools in my process varies enormously depending on the project. Some require a deep integration of digital tools, to check proportions, design 3D prototypes or explore formal interactions. In these cases, digital tools are an essential support, enabling ideas to be tested quickly and aesthetic or technical choices to be validated. In other projects, these tools may be relegated to a secondary role or even absent altogether. This depends on the nature of the project, my artistic intentions and the materials involved. Sometimes they are used to compensate for technical inexperience in a particular area or to communicate an idea more clearly to collaborators or partners.

In my view, the relevance of digital tools lies in their conscious, informed and ethical use. They must not become a reflex or an obligatory part of the creative process. Systematic or unquestioned use runs the risk of standardising practices and losing authenticity. However, when used intentionally, these tools can enrich the creative process by opening up new perspectives or proposing unexpected solutions. They also raise questions about the conceptual and ethical implications of the objects produced. For example, some tools can generate forms that defy physical laws or material constraints, forcing the reflection on the relations between virtual and tangible. Furthermore, these tools impact the design, unconsciously steering creations towards uniform aesthetics or establishing a visual language specific to technology. This can enrich a project but also stigmatise entire practices if this influence is not questioned. The creative responsibility then lies in using these tools as an extension of critical thinking, and not as an end in themselves. Ultimately, digital tools are just one element in a creative ecosystem. They do not replace manual sensitivity or craft skills but complement, extend and even enrich them. Their relevance therefore depends on their harmonious integration into the process, considering the features of each project and its intentions.

Jessie Derogy (January 2025)

5.1.6 The Designer Gaze: Anne Xiradakis Experimentation Proposals

Statement of Practice

Anne Xiradakis develops tableware objects.

In her work, she explores various ways of generating and provoking new or ambiguous uses, drawing inspiration from the observation and reinterpretation of manufacturing and usage gestures. At the same time, her role as a designer remains deeply connected to the workshop, where she envisions alternative production processes—favouring simplified, flexible manufacturing methods that grant artisans greater creative freedom. She seeks to redefine standards in alignment with ecological concerns, incorporating elements such as reduced moulds, waste integration, free-form designs, and production techniques that embrace deformation and limitless tooling possibilities. She has collaborated with renowned chefs, including Guy Savoy, Inaki Aizpitarte, and Jacques Decoret, and companies like Arc International and Bernardaud. Since 2006, her nomadic events—such as *Ephemeral Cafés* (“*Cafés Éphémères”*)*, Gourmet Installations* (“*Installations Gourmandes”)* and *Offbeat Dinners* (“*Dîners Décalés”*)—have served as dynamic platforms where her objects are activated and engaged with by the public. She also shares her teacher expertise at ENSAD Limoges and the Camondo School of Design and Interior Architecture in Paris.

Design Work Examples

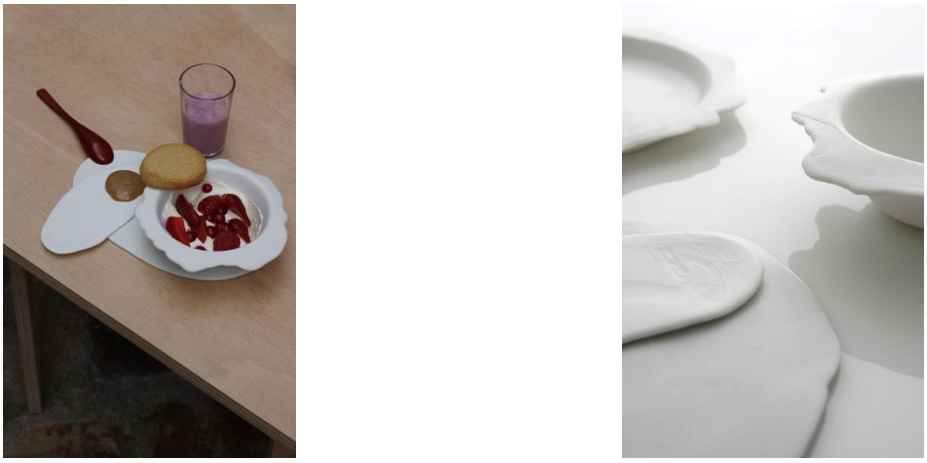


Figure 15. Anne Xiradakis Collection Variables (2010).

Figure 16. Anne Xiradakis Un objet, Une série (2010).

Artist links:

- http://annexiradakis.com
- https://www.instagram.com/annexiradakis/

Reflections on Production and Design Practices

Being a designer who thinks about production can mean ensuring that the project enables the mass production of objects that are homogeneous, stable and free of defects, as required by the market standards. But it can also mean shifting approaches from one technique to another to produce a new appearance, a new surface, as, for example, in Max Lamb's Crockery project, where he sculpts the plaster model with the tools of a stonemason, resulting in a set of pieces with a textured surface. Jessie Derogy's practice also explores these questions in Expérimentation 1, where she skips the model stage by carving directly into the mould.

Some designers are looking for new ways of approaching moulds, imagining them as more versatile, more economical and evolving towards other materials. For example, the project developed by Normal Studio during its residency at Cirva (2015-2017) involves the production of two types of mould that are easy to shape, use economical materials and reveal the material in different ways. The moulds are flexible, made of sewn textile or metal mesh, and offer a wide range of formal possibilities. Another example is François Azambourg, with the Vase Douglas project developed at Meisenthal, he imagines a wooden mould that transforms to create a series with a shape that evolves as production progresses. The cube-shaped wooden mould only allows for fixed blowing, which gradually burns the surface of the mould, giving shape to increasingly inflated objects where the angles disappear. They also imagine objects with a minimum mould, a single plaster plate with a slight hollow, as in the Collection Variables (Figure 15), by Anne Xiradakis, where the artisan draws the shapes and borders of the bowl, directly in the plaster. It is also possible to imagine a single mould that can be used to give shape to different pieces as, for example, in An Object/Series (fig.x) by Anne Xiradakis, a set of pieces produced from a single mould.

Tinted in the mass, as in Jessie Derogy's project with Gradient Dougang (fig. x), it takes advantage of the effect of colour loss during manufacture to make the construction of the object, by level, more legible. In addition, the object‘s shape creates gradient colour effects by gravity; the shape creates the decor.

A different way of thinking about production might be to consider how the maker can avoid being alienated by their work, as Gaetano Pesce tried to do with the Sansone project, where the craftsmen are also designers by choosing the colours to be poured into the mould, but also by creating patterns on the surface of the table. Another way for the designer to reconsider the stages of production is by thinking about the materials used in the project. With the Rotoman project, the Maximum collective has turned a stool on its head by incorporating daily-made compulsory samples to test the material.

Anne Xiradakis (July 2024)

5.1.7 Working Methods and Creative Approach

For this project, the designer’s approach is based on a reflection on CRAEFT documentation practices of traditional Limoges porcelain techniques, the starting point being observation practices and analytical insights using raw video footage of the Plaster Turning phase recorded as part of the ethnographic protocol. She made three different creative propositions using design methods, using these materials.

Design-Based Proposition 1: *Arrêt sur Image*

The designer carefully observed and analysed the recorded videos of the plaster turning sequence, focusing on the subtleties of hand positions and tool interactions during various technical actions. Moments that captured pivotal stages in the manufacturing process were selected and redrawn to reinterpret the source, while introducing a deliberate distance from the subject, resulting in drawings that support new forms combining tools and forms in the process of becoming.

This project’s idea draws from archival documentation of the porcelain cup-making process to create an object presented in five distinct variations. These variations correspond to the five different production phases and incorporate the turning tools alongside the visible effects of these tools on the material. The outcome will be a series of five cups, each representing a stage of creating the same piece. These objects

embody the gestures of the production process, enabling us to, in a way, "touch" the movements and gestural knowledge that shaped them.

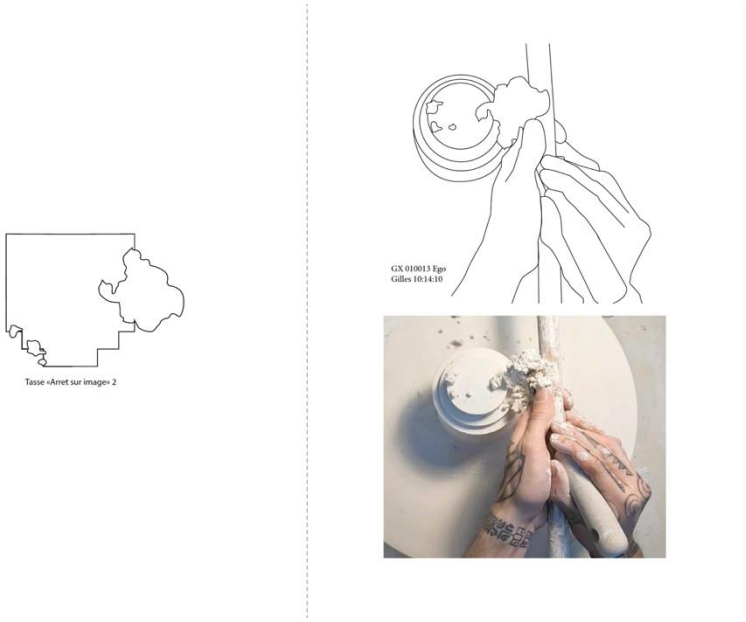


Figure 17. Anne Xiradakis, Proposition 1: Arrêt sur Image, working materials (2025).

Design-Based Proposition 2: *The Sliding Project*

Based on an analysis of a series of videos documenting the plaster turning sequence, the designer has captured a sequence linked to a specific material. This action is made of several gestures that the designer moves, and applies to another material, to produce a new result from the same gesture. Use a brush to apply soap to prevent the plaster we're about to pour from sticking to the central core. The circular movement of the brush in the palm, then wringing it out between the thumb and forefinger, allows the superfluous soap foam to be pressed and extracted. The hand moves in circles in the liquid plaster to activate, and collect air bubbles, then throws the material away in a pressing movement to make it flow into another container to check its fluidity. *The Sliding Project* reinscribes these two gestures with soap and plaster in another context, a culinary performance presented in a video, where soap and plaster would be replaced by culinary materials such as jelly or ganache.

Figure 18. Anne Xiradakis, Proposition 2 The Sliding Project, working materials (2025).

Design-Based Proposition 3: Forms of Gestures (Experimentations)

The designer puts her practice into dialogue with the video recordings of the Plaster Turning sequence to produce a series of experiments to become potentially new projects.

The *Formes of Gestures* project explores adapting and transferring traditional gestures, particularly those used in the Japanese Tea Ceremony, to other forms, objects and materials. These gestures, which play a part in both the ceremony and the creation of objects, are delicate means of expression that establish a link between craft and hospitality, as exemplified by the practice of Tea Master Kimura Soshin. The original project was presented in two main formats which were directly inspired by the traditional gestures of the tea ceremony:

- *Formes of Gestures 1* (Tea Ceremony): The same gesture produces different shapes. Existing gestures that use a different material to produce a new shape (pastry-making)
- *Formes of Gestures 2* (Support Object): An object that carries the gestures of another object. Existing gestures linked to an object shape give a new object shape

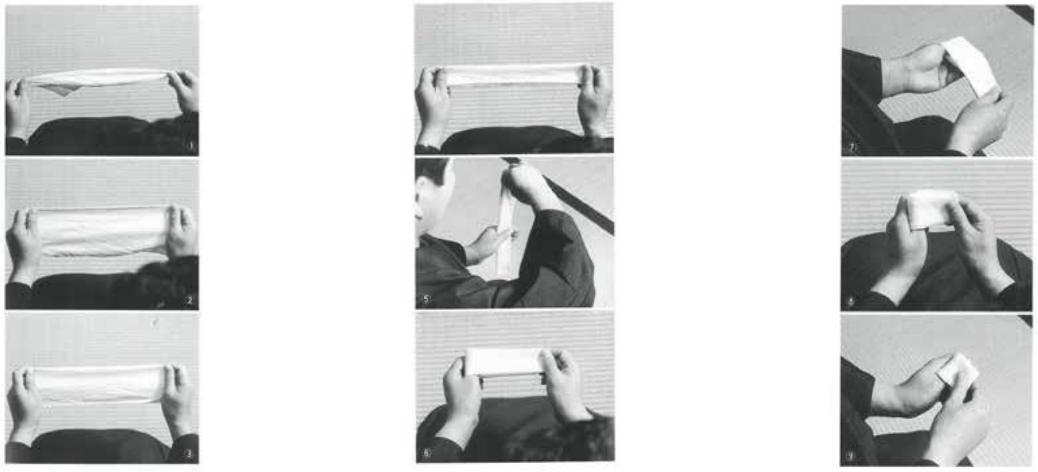


Figure 19. Gestures for learning how to fold the Chakin from a tea ceremony manual.

Figure 20. Left: The Tea Master, Kimura Soshin, folds the pastry like a Chakin. Right: Anne Xiradakis, Forms of gestures, Ceremony 2016.

Experimentation 1: Same gesture, different shapes

This exercise involves reproducing identical gestures, in the same device (wheel), but using other materials. For example, by replacing the raw material of ceramics with materials such as wood or porcelain, the same gestures generate new and unexpected shapes.

Experimentation 2: Transferring gestures to other tools

This experiment proposes transferring gestures associated with an object to different tools. For example, a practitioner might use stonecutting or woodcarving tools to create the shape of a cup. The aim is to see how the gesture can be modified or enhanced, using a different tool.

Experimentation 3: Reproduction with different craftspeople and tools

Using their tools, the object (a cup) is reproduced by crafts practitioners such as stonecutters or woodcarvers. Each practitioner, while subject to the same intention of reproduction, will see their gesture modified by their know-how and tools, offering a variety of unexpected results and unique interpretations. *Table tools* are a series of designed utensils transferred to a more fragile material, porcelain or glass paste, requiring the user to use a more delicate gesture, resulting in a subtle transformation of the gesture.

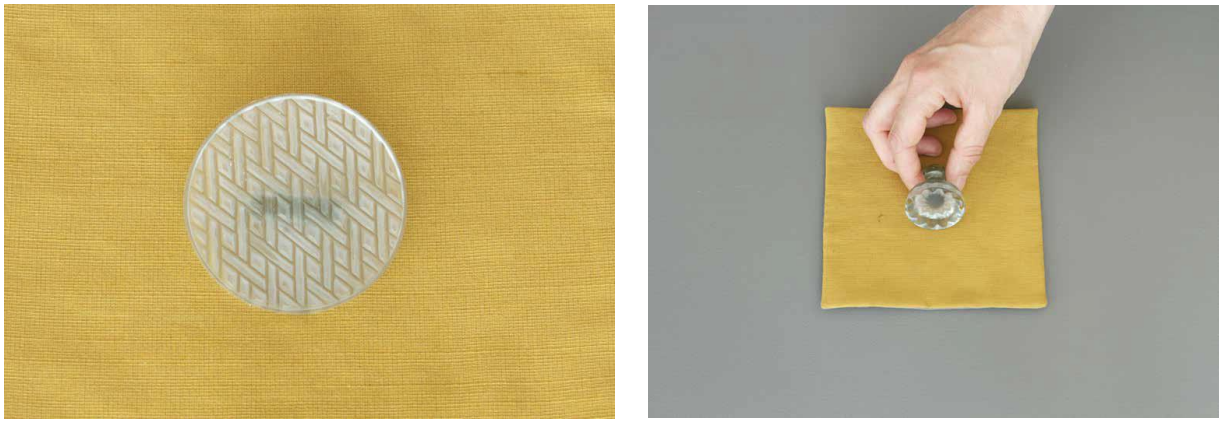


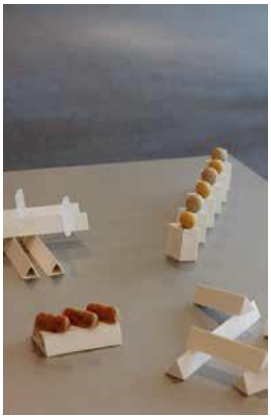
Figure 21. Anne Xiradakis, Table Tool 2, glass paste (2013).

Experimentation 4: Transferring gestures through different materials

This experiment explores how the same shape can be made through several materials, such as bamboo, plaster, cut stone or rough stone. Each material, with its specific features and characteristics, subtly influences and transforms the gesture, while adding a new dimension to the final object. *Presentation utensils Series 1-2-3*: Three series of utensils, the first formally resembles the basic utensil, then series 2 and 3 move away from it while retaining the potential of the basic utensil. (incised, stamped, shaped, etc.)

Experimentation 5: Transfer of gestures with tools whose shape has been modified

The practitioner reproduces the gestures used to create the shape of the cup using tools whose modified shape: by adding the same shape, making the same shape more complex or enlarging the same shape.



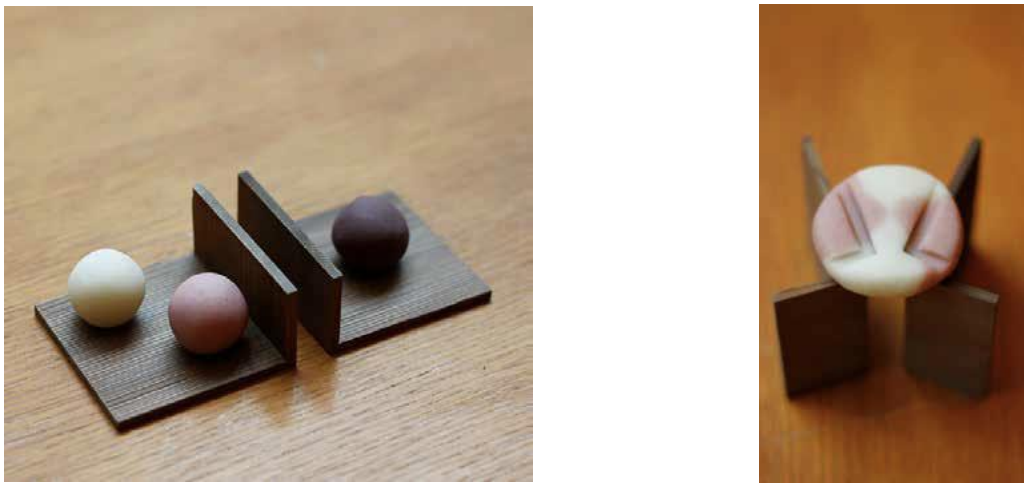


Figure 22. Anne Xiradakis Ustensiles à présenter Série 1-2, Villa Kujoyama (2016).

5.2 Case Study 2: CNAM / Tapestry as Image Technology: Between Gesture and Illusion

In the *Tapestry Design Pilot*, we explore an alternative narrative of tapestry weaving that goes beyond its traditional perception as a heritage artefact. Tapestry is examined for its monumental textile characteristics, ability to create illusion through the faithful reproduction of a design template, and its creative process, which functions as an analogue to an image-making language. The tapestry emerges as more than a decorative or historical object. It is positioned as a potential immersive tool, capable of engaging viewers on a multisensory level. It connects traditional craftsmanship with modern design and digital innovation. It is also explored as an instrument of information, capable of conveying complex narratives, an extension of language through its woven symbols and patterns, and a memory medium, preserving cultural stories and histories within its fibres. This approach highlights the tapestry's dual nature as a physical object and a technological process, bridging tradition and contemporary practice.

5.2.1 Lauriane Obry: Weaving Tradition and Innovation into Design

The *Tapestry Design Pilot* led by designer Lauriane Obry exemplifies her unique ability to bridge the realms of traditional craftsmanship, contemporary design, and digital technology. Trained as a *licière* (a traditional tapestry weaver) at the Manufacture des Gobelins, she began her career deeply rooted in the rich heritage of French artisanal weaving. Building on this artisanal expertise, Obry pursued master studies in design, graduating from ENSCI – Les Ateliers, one of France's most prestigious industrial design schools. There, she started reimagining tapestry-making as a space where heritage weaving techniques intersect with innovative, contemporary design practices. She leverages digital technology as a crucial tool to achieve her vision. She explores how traditional weaving can be augmented to create functional, interactive, and sustainable designs that push the boundaries of what tapestry can be, through computational design and digital fabrication processes. This project earned her the renowned Bourse Agora for Research in 2023 and recognised her ability to innovate within the framework of artisanal practices. It became the foundation for the *Tapestry Design Pilot*, where Lauriane will expand her exploration of tapestry-making as a contemporary design practice. Lauriane Obry sees the loom not only as a tool for weaving but as a platform for dialogue between past and future, craft, and technology. At

the core of Lauriane Obry's practice is the belief that design and craft are inseparable. Her work redefines the value of artisanal objects in a technological age, showcasing how heritage techniques can evolve to meet present-day demands. For Obry, weaving is not only a craft but a method of storytelling, sustainability, and innovation.

Her dual identity as a *licière* and a designer enables Lauriane Obry to seamlessly merge the tactile, material world of craft practices with the abstract, problem-solving nature of design. This hybrid approach defines her role in the *Tapestry Design Pilot*, where she reimagines traditional tapestry-making through the integration of digital technologies. Under her direction, the pilot explores how weaving can evolve beyond its decorative origins into a functional, interactive medium. Her work in this context remains poetic and deeply rooted in the essence of material and place while addressing contemporary challenges and opening new possibilities for design innovation.

5.2.2 From Historical Innovation to Contemporary Design in the Tapestry Design Pilot

Initially, woven compositions relied on simple rhythmic lines to delineate colours and forms. However, the *hachure* technique at the end of the 14th Century marked a transformative moment in tapestry-making. By interweaving lines of varying sizes and rationalising them into a shared visual language among weavers, *hachure* enabled half-tones and optical effects that produced the illusion of volume. Without explicit guidance from the *cartonnier* (the designer of the cartoon), the *licier* (the weaver) had to integrate these linear effects intuitively, ensuring the proportions of the drawing, the blending of colours, and the quality of the textile were all maintained. The result was a woven "technical drawing," where *hachure* lines of varying lengths and thicknesses gave the composition a sense of depth and realism, modelling drapery, flesh, and creases to bring movement and relief to life. This immersive potential transformed the tapestry into a medium that interacted dynamically with viewers, enhancing its realism and expressive power.

In this way, tapestry reveals itself as a sophisticated system where the visual language of design (*hachure*) intersects with the immersive potential of the woven medium. This perspective on tapestry as a technology of image-making provides the foundation for reimagining in the *Tapestry Design Pilot*. The pilot explores how traditional techniques like *hachure* can inspire modern design practices, particularly through integrating digital tools. Just as *Hachure* once introduced a new way to model light, volume, and interaction within a woven medium, the design pilot uses contemporary technologies—such as computational modelling—to expand the mediation of tapestry.

Lauriane Obry treats the loom as a platform for artistic expression and technological experimentation. The pilot reimagines tapestry as a functional and interactive system, much like its historical predecessors, while leveraging modern design processes to create pieces that resonate with today's technological concerns. This approach positions tapestry as a decorative or heritage craft and a dynamic and forward-thinking medium with untapped potential in contemporary design.

5.2.3 Tapestry as Image Technology: Between Gesture and Illusion

The *Tapestry Design Pilot* explores how traditional weaving techniques can intersect with contemporary technological advancements to create new forms of artistic and functional expression. At its core, the

pilot examines the untapped potential of tapestry as a medium for immersion and virtuality, offering a tactile and visual alternative to digital experiences. While digital technologies often dematerialise interactions, tapestry provides a counterpoint as a physical, tangible medium capable of creating immersive environments and optical illusions. Building on its legacy of innovation, exemplified by techniques like *hachure*, the pilot reimagines tapestry as a bridge between the physical and the virtual, opening new avenues for exploration.

The pilot addresses a central question: how can a medium rooted in tradition and materiality respond to contemporary demands for immersive and interactive experiences? The answer lies in leveraging the tapestry's unique qualities—tactile presence, narrative capacity, and adaptability—while integrating modern tools such as augmented reality (AR), stereoscopy, and interactive technologies. These tools enable the creation of new narratives and dynamic experiences that enhance engagement and accessibility.

AR enhances the visitor experience by offering high-definition visuals of woven elements, highlighting the quality of stitches, vibrancy of colours, and subtle textures. This detailed view reshapes tapestry as a medium for storytelling, encouraging a deeper appreciation of its craft and artistic value. The pilot also employs "low-tech" stereoscopy to evoke notions of relief and realism. By using optical effects, visitors experience the tapestry as both a physical and virtual object, blending tangible and digital dimensions. This approach virtualises the woven surface, presenting tapestry as an immersive, interactive art form. Interactivity plays a central role in the pilot, redefining museum engagement. Visitors use smartphones to interact with encoded information within the tapestries, unlocking animations, detailed visuals, and scaled interpretations. These interactions foster curiosity and offer new ways to explore the art, creating a personalised and dynamic experience. The pilot reexamines tapestry's historical role as an "art of the multiple." Traditionally woven in multiple versions, each unique yet sharing a common origin, tapestry gains new dimensions through digital enhancements. Visitors can explore alternative versions of the artwork, revealing details, animations, and scaled proportions, enriching its narrative and artistic potential.

The pilot redefines tapestry as a medium for information, interaction, and immersion, combining traditional craft practices with cutting-edge technologies. It shifts its role from a static heritage object to a dynamic interface that engages with artistic, ecological, and technological challenges. The pilot asks critical questions about the tapestry's relevance in the digital age, such as how it can balance its physical materiality with the possibilities of digital and interactive mediums. Through its innovative approach, the *Tapestry Design Pilot* demonstrates how traditional craft-making can evolve to meet the demands of present-day design and technology, ensuring tapestry remains a living, relevant, and innovative art form.

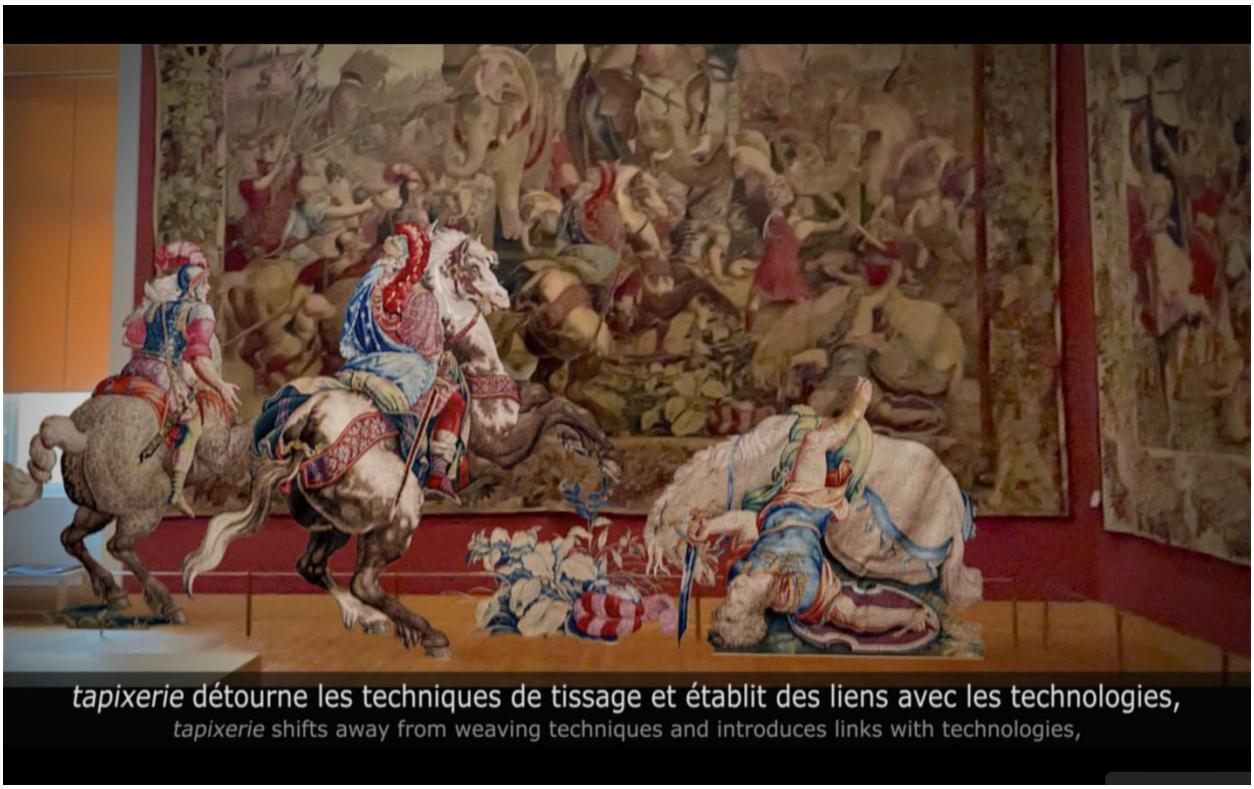


Figure 23. Lauriane Obry, Tapixerie (2022) (image: Lauriane Obry).

5.3 Case Study 3: CERFAV / Glass and Interactivity: The Material in Motion

The *Glass Design Pilot* emphasises the importance of movement—literal and metaphorical—in glass as a medium. Glass, inherently fluid during its formative process, embodies motion and transformation. This characteristic extends to the craft itself, where each generation of artisans develops new ways to engage with the material, reflecting broader cultural and technological shifts. The *Design Pilot* encourages participants to interrogate this notion of movement, pushing them to consider how integrating digital tools and interactivity can redefine the essence of glassmaking.

From September 30 to October 4, 2024, students from the *Créateur Verrier* program (32nd cohort in Glass Creation) explored various ways to make their glass creations interactive. Guided by designer Auguste Hazemann and supported by the CERFAV team, they extensively experimented with FabLab's resources. The workshop bridged traditional glassblowing techniques with innovative digital tools, encouraging students in Glass Creation to rethink the relationship between materiality and interactivity in their work. Participants stepped back and critically assessed their creative processes, through hands-on experimentation and reflective discussions. This reflective approach enriched their understanding of glass as a medium and introduced new possibilities for integrating design and technology.

5.3.1 Auguste Hazemann: Collaborator in the Glass Design Pilot

Auguste Hazemann, a designer and researcher in digital arts and humanities, brings a unique perspective to the *Design Pilot*. With a background in object design from the École Nationale Supérieure des Arts Décoratifs de Paris (ENSAD), Auguste has cultivated a practice that bridges traditional craftsmanship and digital innovation. His work emphasises the sensory and technical qualities of objects, exploring how digital and electronic technologies can serve as interactive and narrative media. Currently pursuing a PhD at the DeScripto research laboratory at the Université Polytechnique des Hauts-de-France, Auguste's design-based research focuses on the relational dynamics between humans and non-humans—specifically objects—while rethinking the role of technology. His approach rejects purely solution-oriented design, instead fostering a dialogue that positions humans within their technological environment. Inspired by biodiversity, his projects explore how objects and devices communicate autonomously, inviting users to discover connections and modes of interaction.

Auguste's work with CERFAV builds on his long-standing fascination with glass as a material of expressive and functional potential. His earlier collaboration with glassmakers at CIAV led to *Spiro*, a lamp inspired by the symbolic and functional act of the glassblower's initial breath. By integrating sensors and coding, Auguste transformed the act of blowing into an interactive element, placing the gesture at the heart of the object's functionality and narrative. Auguste continues to explore how digital technologies can augment traditional glassblowing techniques. His hands-on experience, including learning glassblowing at NID in India, has enriched his ability to bridge traditional craft with modern design. His work at CERFAV focuses on understanding how digital tools, such as sensors, coding, and interactive design, can enhance the materiality and storytelling potential of glass while respecting its heritage.

Auguste Hazemann's contribution to the *Design Pilot* highlights the potential for combining craft and digital innovation, creating a dialogue between tradition and technology that aligns with CERFAV's mission to advance the art and science of glassmaking.

5.3.2 Glass Design Pilot: Glass and Interactivity—The Material in Motion

The *Glass Design Pilot*, titled *"Glass and Interactivity: The Material in Motion"*, focused on creating hybrid objects that bridge craft practices and digital technology. The workshop encouraged participants to critically explore integrating traditional glassmaking techniques with interactive digital elements. To achieve this, designers and artisans engage with concepts drawn from the humanities, such as anthropology, history, and philosophy, fostering a reflective approach to their creative practices.

Through initial discussions and activities, participants were introduced to methods for critically analysing their work, and situating themselves within a broader community of practices. They also receive hands-on training in electronics and programming, enabling them to develop a language of interactivity. This exploration challenges them to question what these technologies can contribute to traditional craft-making and how interactive objects are perceived by audiences.

A key challenge of the workshop was avoiding superficial combinations of craft and technology—for example, simply embedding a Bluetooth speaker into a glass case. Such a combination would render the case interchangeable with other materials like plastic or wood, undermining the specificity of the glass medium. Instead, the interaction must become an inseparable part of the object, deeply tied to the creator's intention and the material's unique qualities. Achieving this requires a reflective approach, encouraging participants to create meaningful connections between form, function, and interactivity.

After the workshop, participants were required to present a functional prototype of their creations. In addition, they documented and communicated their research and production process through an exhibition and oral presentation, detailing their intentions, creative journey, and reflective practices. This approach ensures that the CERFAV *Design Pilot* not only promotes technical innovation but also deepens the understanding of how tradition and technology can coalesce to create meaningful, innovative works.

5.3.3 Integrating Reflexivity into the Glass Design Pilot Methodology

The *Design Pilot* methodology developed at CERFAV emphasises the integration of reflexivity as a core component of its approach. This element is essential in bridging traditional craft practices with digital innovation while maintaining a deep connection to the cultural, material, and social dimensions of craft practices. Through guided workshops and reflective practices, participants were encouraged to critically engage with their materials, techniques, and the broader implications of their creative work.

Material Awareness in Design

Central to the methodology is the notion that materials like glass are not neutral entities but deeply embedded in cultural, environmental, and historical contexts. By exploring the materiality of glass, participants are prompted to consider its connections to specific territories and resources, such as the forests of Lorraine and the traditional processes of sourcing potash. This material awareness reinforces the CERFAV *Design Pilot's* aim to contextualise craft within its local heritage, helping designers to make informed and meaningful choices about how they incorporate materials into their creations. The reflective component of the methodology asks participants to interrogate questions such as: *Why choose this material? What narratives does it convey about its origins? How can these narratives be integrated into the design process?* These inquiries are crucial for ensuring that the use of glass—and by extension, any material—respects its heritage while opening pathways for innovation.

Craft Heritage and Social Dynamics

The CERFAV *Design Pilot* methodology also emphasises the role of craft as a cultural and social practice, shaped by historical relationships and workshop dynamics. By situating their work within the lineage of glassmaking traditions, participants are encouraged to reflect on how their creations can honour this heritage while addressing contemporary challenges. This involves questioning how social hierarchies, gender roles, and consumer relationships within the craft industry have evolved and how design can challenge or reinforce these dynamics. For example, the hybridisation of glass and electronics, a focal point of the CERFAV pilot, provides an opportunity to explore interactivity not as an add-on but as an integral aspect of the object. Participants are guided to think critically about how new technologies can transform the aesthetic and functional language of glassmaking, fostering innovation while remaining sensitive to its traditional context.

Reflexivity in the Design Process

Reflexivity is woven throughout the CERFAV *Design Pilot* to foster deeper engagement with both craft and design. Students and practitioners are encouraged to ask critical questions about their creative processes, the implications of their choices, and the narratives their work conveys. This reflexivity is supported through structured workshops that combine hands-on experimentation with discussions about cultural heritage, environmental sustainability, and the potential of digital tools. In this way, the CERFAV *Design*

Pilot methodology positions reflection not as a secondary consideration but as a driver of innovation. By encouraging participants to articulate and justify their creative choices, the methodology ensures that the integration of traditional and digital practices is meaningful, purposeful, and rooted in personal and cultural authenticity.

Outcomes Aligned with the Design Pilot

The emphasis on reflexivity culminates in outcomes that align with the *Design Pilot's* broader goals. Participants develop functional prototypes that blend traditional and digital elements and create narratives articulating cultural and philosophical dimensions. These outcomes are showcased through exhibitions and presentations, demonstrating the potential of the *Design Pilot* to transform how craft is perceived, practised, and communicated in contemporary design contexts.

By embedding reflexivity into its methodology, the *Design Pilot* ensures that the integration of tradition and technology is innovative and respectful, creating a foundation for the sustainable evolution of craft practices.

5.3.4 Integrating Movement, Materiality, and Interactivity

In today's world, digital technologies profoundly reshape objects and our interactions with them. Glassmaking, too, has felt the influence of digital tools, from computer-aided design to advanced production technologies. However, this shift is not without challenges. For many artisans, digital techniques can feel detached from the material, even a loss of ownership over their craft. The high-profile example of Lalique's "Impossibles Vases," digitally designed but with high market value, raises questions about the role of craft when objects become partially or entirely digital.

Through the workshop, the Design Pilot provides a space for glassmakers to reflect on these transformations, express their experiences, and explore ways to integrate digital tools meaningfully into their practice. Rather than viewing technology as a replacement for traditional techniques, participants are encouraged to see it as a complementary tool that enriches their craft.

Humanist and Ecopoetic Approaches to Interactivity

The workshop invites participants to reframe their understanding of objects and interactivity. Drawing on the ideas of thinkers like Bruno Latour, it introduces the concept of objects as "agents" within society—active participants that shape human action and connection. In this context, interaction embodies these objects and highlights their active roles. Participants are encouraged to consider their cultural, historical, and poetic dimensions, moving beyond the purely functional to develop objects that resonate on a deeper level.

Several principles guide this exploration:

1. Objects as Storytellers: Glass objects carry layers of meaning, from technical know-how to social customs and potential future narratives. Participants are encouraged to approach their work as both encyclopaedic and poetic, reflecting the richness of human history and the possibilities of new interactions.

2. An Ecopoetic Perspective: Glass objects are seen as integral to their environment, participating in the broader movement of the world. This perspective fosters care for the material and its context, encouraging collaborative rather than exploitative relationships.
3. A Critical Approach to Technology: The workshop emphasises the importance of maintaining a balanced relationship with digital tools. These tools are part of a broader set of techniques, used thoughtfully and without overreliance. Experimentation and practice allow participants to master these technologies while retaining creative autonomy.

From Reflection to Creation

The *Glass Design Pilot* combines reflective inquiry with practical experimentation. Participants engage in hands-on activities, using digital tools such as sensors and interactive elements to explore how motion and interactivity can enhance their creations. They learn to articulate their ideas and translate complex narratives into tangible objects, experimenting with simple, functional prototypes. Ultimately, the workshop emphasises the strength of interactive objects in their ability to create meaning. By integrating humanist perspectives, ecopoetic insights, and digital techniques, participants develop works that balance tradition and innovation, honouring the heritage of glassmaking while envisioning its future in a rapidly evolving technological landscape.

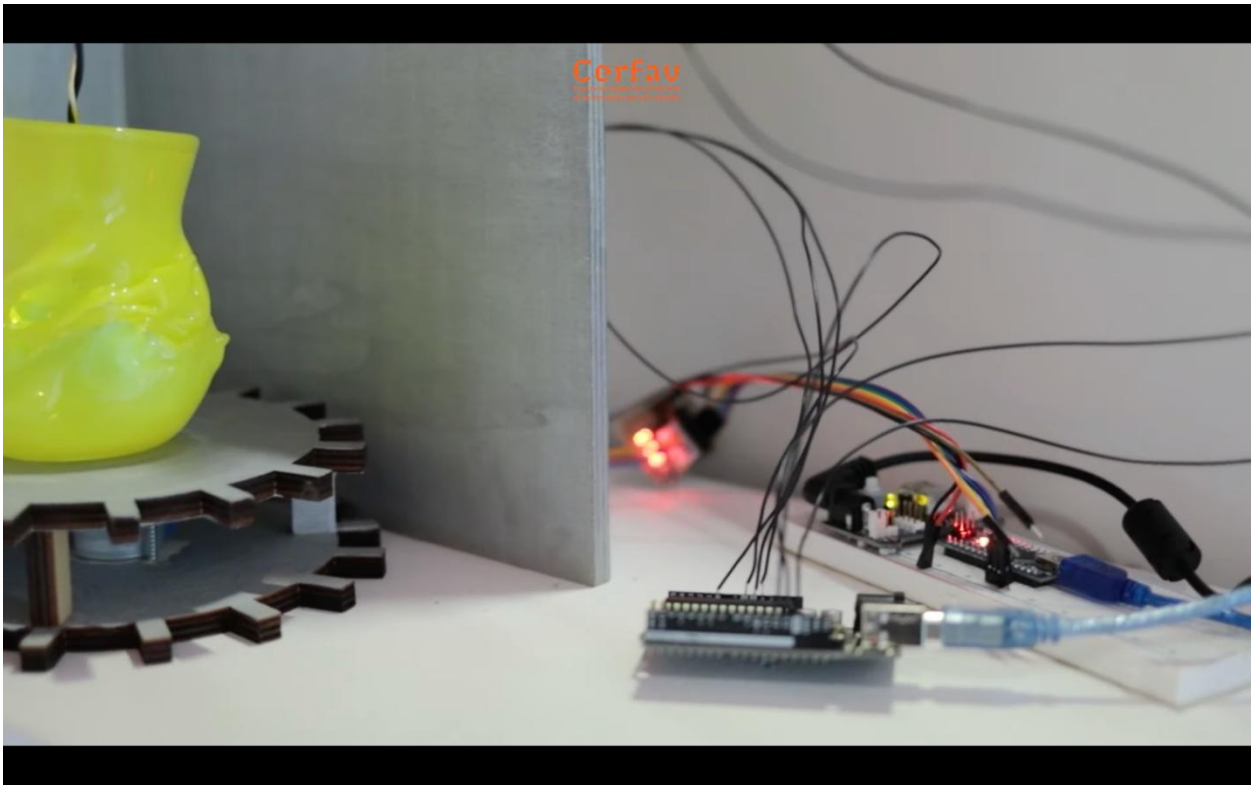


Figure 24. Workshop Glass and Interactivity: The Material in Motion, led by August Hazemann, project by Justine Ressot Faire Chanter le Verre (2024) CERFAV (Image: CERFAV/Julia Schaff).

5.4 Case Study 4: (Example) CETEM / Furniture and Woodworking

Florian Moreno: Studied Industrial Design at the School of Applied Arts and Artistic Trades in Valencia. In 1985, he joined the Design Department at GRANFORT, the largest upholstery company in Spain. In 1989, he opened his own Industrial Design studio in Yecla as an independent designer, working for the furniture sector and companies at a national level. Currently, Florian carries out habitat projects, for homes and installations.

Artist link: https://florianmoreno.es/proyectos/

5.5 Case Study 5: (Example) PIOP / Design, Craft and Cultural Heritage

The *PIOP Design Pilot* emphasises the role of design as a medium for storytelling, preservation, and cultural expression. Drawing inspiration from the foundation's museum collections, the pilot supports designers in creating objects that reflect historical craft-making while addressing modern design contexts.

5.5.1 Achilleas Georgiadis: Designer Collaborating with the PIOP Design Pilot

Achilleas Georgiadis is a designer with a ten-year career in creating unique jewellery and art objects. His work is deeply rooted in the intersection of traditional craftsmanship and contemporary design, making him a pivotal collaborator in the *PIOP Design Pilot*. He began his professional journey with a strong foundation in ceramic technology, exploring the design of ceramic objects before transitioning into jewellery design. In 1996, he established his jewellery design workshop, where he developed his expertise working with diverse materials, particularly metal and marble. As a founding member of Jewellery Art Workers (J.A.W), a collaborative workshop specialising in jewellery and art objects, Achilleas Georgiadis exemplifies the collaborative spirit essential to contemporary design practices. His involvement with J.A.W highlights his commitment to fostering creativity and innovation within a community of like-minded artisans and designers.

Over the past three years, he has worked closely with PIOP to create exclusive jewellery pieces inspired by the rich cultural heritage represented in PIOP's museum network. This collaboration includes designs from the Museum of Marble Crafts and the Silversmithing Museum. For this collaboration, he produced a series of 17 jewellery pieces, blending traditional materials such as marble and silver with contemporary aesthetics. These designs are deeply inspired by the historical and cultural narratives encapsulated in PIOP's collections. His work bridges heritage and innovation, referencing traditional techniques and motifs while introducing modern design sensibilities. His design reflects a profound respect for cultural heritage and the role of materials in storytelling. His ability to reinterpret traditional crafts through the lens of contemporary design aligns seamlessly with PIOP's vision for the Design Pilot. By integrating marble and silver, materials central to the museums' narratives, he emphasises cultural and material specificity, ensuring each piece resonates with the heritage it represents. His work demonstrates how traditional crafts can be revitalised and adapted to today's contexts without losing their essence. This approach

enhances the cultural value of PIOP's museum network and serves sustainable and innovative craft-design integration. His work in the *Design Pilot* highlights the importance of storytelling through materials within the broader framework of heritage and innovation.

5.5.2 Design as a Tool for Heritage Preservation

The project emphasises the use of design to preserve and reinterpret cultural heritage. Designers collaborating with PIOP draw material and thematic resources from its museum network, including the Museum of Marble Crafts and the Silversmithing Museum. By working with traditional motifs, materials, and techniques, the pilot ensures that these elements are adapted and integrated into modern creative practices.

The *Design Pilot* will explore how traditional crafts can coexist with modern design methodologies and technologies. While rooted in historical practices, the initiative encourages innovation by incorporating digital tools and processes. This allows designers to experiment with new forms and techniques while maintaining a strong connection to the craft's heritage. An important aspect of the pilot is the production of objects for sale in museum shops. Inspired by the museum collections, these pieces provide visitors with tangible connections to the cultural narratives presented in the exhibits. This approach helps bridge the gap between heritage and contemporary audiences, making cultural traditions accessible and relevant.

5.5.3 A Platform for Sustainable Craft-Design Practices

The *Design Pilot* fosters a sustainable approach to craft and design by ensuring that traditional practices remain relevant in today's creative industries. By supporting collaborations between designers and the museum network, the initiative provides a practical framework for integrating heritage into contemporary design while creating cultural engagement and education opportunities.

In summary, the *PIOP Design Pilot* seeks to create a dialogue between past and present by supporting the reinterpretation of traditional crafts through contemporary design practices. It is a platform for exploring how heritage can inform innovation while remaining accessible and meaningful to modern audiences.

6. Conclusion and Outlook

The *Design Pilot* demonstrates how the intersection of design and present-day technologies can redefine the landscape of artisanal tradition. By blending heritage crafts and contemporary design with advanced digital tools, the pilot has explored the potential for innovation in fields ranging from tapestry and porcelain to glass and furniture-making. Each Representative Craft Instance (RCI) brings unique cultural, material, and technical contexts, underscoring the diversity and complexity of integrating tradition with innovation.

6.1 Challenges in the Diversity of Design Contexts

One of the primary challenges of this endeavour lies in the inherent diversity of the design contexts across RCIs. Each initiative operates within distinct cultural, material, and industrial conditions that demand tailored approaches. For instance, in some cases, traditions are deeply tied to localised materials and techniques, while others may focus on preserving disappearing artisanal practices. Balancing these traditional foundations with the universal application of digital tools requires careful consideration to ensure that technological integration enhances rather than undermines regional identities.

Another layer of complexity arises from the diversity in the design definition. Across different RCIs, design is understood and practised in varying ways, ranging from functional problem-solving to an artistic or symbolic expression of cultural identity. In some cases, design is inherently linked to artisanal production, emphasising the craft's intimate, hands-on nature. In others, design is viewed through the lens of industrial efficiency, prioritising scalability and market demands. This disparity in conceptualisation leads to challenges in developing shared methodologies and tools that resonate across all contexts. Bridging these divergent understandings requires a sensitive and inclusive approach that respects and integrates these multiple perspectives.

Additionally, the scalability of traditional practices presents another challenge. While digital tools like algorithmic design, augmented reality, and rapid prototyping offer scalability and customisation, they can sometimes risk homogenising local craftsmanship if not thoughtfully applied. Ensuring that each craft retains its unique character and cultural resonance while adapting to modern demands is a delicate balance.

Addressing these challenges demands an adaptable framework that values regional identities, supports context-specific definitions of design, and promotes innovation without compromising the essence of tradition.

6.2 Opportunities in Contextual Diversity

Despite these challenges, the diversity of design contexts presents immense opportunities for innovation and cross-disciplinary learning. By tailoring solutions to the specific needs and strengths of each RCI, the pilot highlights how different traditions can inspire and inform one another. For example, the precision of glassmaking can influence techniques in digital fabrication, while the narrative capacity of tapestry might offer insights into augmented reality applications. This cross-pollination enriches the innovation potential and ensures a dynamic, evolving design methodology.

The pilot demonstrates that integrating traditional crafts and digital tools can transform sustainability, cultural preservation, and community engagement. By leveraging digital technologies to preserve and revitalise endangered techniques, the series of RCIs contribute to the longevity of regional traditions while making them relevant to contemporary design challenges.

6.3 Outlook: Expanding Horizons

The *Design Pilot* provides a roadmap for future explorations of the intersection between craft, design, and technology. As it evolves, the focus should remain on fostering dialogue among the RCIs, encouraging collaborative projects that build bridges across disciplines and regions. Expanding the scope to include more diverse materials, contexts, and technological tools will deepen the pilot's impact and uncover new possibilities for innovation.

Furthermore, engaging broader audiences—through interactive museum experiences, educational programs, or digital platforms—can ensure the pilot's outcomes are accessible, fostering a wider appreciation for the synergy between tradition and technology. The pilot's success relies on its ability to adapt to the changing needs of artisans, industries, and communities while staying true to its commitment to preserving cultural diversity.

In conclusion, the *Design Pilot* highlights the challenges and opportunities of merging tradition with innovation. By embracing the diversity of design contexts and leveraging the unique strengths of each RCI, it positions itself as a powerful force for shaping the future of design—one that honours the past while boldly stepping into the future.

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