CRAEFT

care, judgment, dexterity

P3 – Valorisation, methodology, and results

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Executive summary

This deliverable reports the Valorisation Pilot (P3) of the CRAEFT project, funded under the Horizon Europe research and innovation programme. The pilot examines how carefully designed digital technologies can enhance the value, visibility, and sustainability of traditional European crafts while maintaining authenticity, cultural specificity, and practitioner-led character. CRAEFT treats craft not as a static heritage asset, but as a living, knowledge-rich practice—grounded in embodied skill, sensory judgement, and situated expertise—that can engage productively with contemporary digital, social, and market environments.

The deliverable provides a consolidated account of the pilot's conceptual framing, methodology, implementation, and evaluation outcomes. It shows how research knowledge, craft expertise, and digital innovation are combined to produce tangible outputs—experiences, tools, services, and products—targeting craftspeople, cultural institutions, learners, tourists, and the wider public. In doing so, it contributes to the European Union's ambition for knowledge valorisation, demonstrating how research results can be translated into social, cultural, environmental, and economic benefit.

Purpose and context

Traditional crafts across Europe face persistent pressures: declining practitioner numbers, limited market access, competition from mass production, and reduced visibility among younger and international audiences. In parallel, rapid digital transformation can marginalise craft unless digital tools are adopted in ways that respect craft values and do not impose unsustainable burdens on makers and small organisations. Within CRAEFT's broader research agenda—capturing, modelling, and transmitting craft knowledge—the Valorisation Pilot focuses on how digital technologies can add value to craft practice and craft-based economies, without displacing practitioner agency.

Valorisation is approached holistically. Alongside financial returns, the pilot addresses cultural enrichment, learning and knowledge transmission, community engagement, and environmental responsibility, consistent with EU policy on knowledge valorisation across technological and non-technological domains.

Objectives and measurement

The Valorisation Pilot aims to:

- enhance the cultural, social, economic, and environmental value of crafts through digital means;
- support practitioners by expanding visibility, audiences, and income opportunities;
- develop new products, services, and professional profiles at the intersection of craft and digital technologies;
- foster learning and engagement through interactive, experiential, and playful formats; and
- demonstrate models that are replicable beyond the CRAEFT project.

Progress is monitored through Key Performance Indicators (KPIs), including the production of digital artefacts, new products and services, and emerging professional roles linked to craft and digital innovation.

The pilot is organised around **four pathways** for adding value:

1. Experiences: Digital and hybrid cultural experiences that support learning, cultural tourism, and public engagement, including mobile applications, 360° tours, VR experiences, and multimedia storytelling. A key outcome is evidence that well-scoped digital experiences can extend access beyond physical sites, enrich museum visits, and provide practical discovery tools for craft-related destinations, while also supporting dissemination by practitioners and institutions.
2. Games: Craft-inspired digital and physical games, toys, and playful learning environments that communicate both explicit and tacit knowledge (sequencing, material handling, embodied skills). The work demonstrates how play can function as an inclusive medium for cultural transmission, engaging children, families, and non-specialists through interaction, DIY making, and guided exploration.
3. Retail: Digital support for craft products in market contexts, including storytelling, provenance and authenticity documentation, and marketing assets that communicate origin, maker, production method, and sustainability credentials. The pilot shows how digital augmentation can strengthen differentiation and trust, enabling service models that assist craftspeople in positioning products within contemporary retail and cultural economies.
4. Makers: Maker-oriented approaches centred on making processes (notably mould-making) that occur across multiple crafts. Through experimentation with digital tools and alternative materials, this dimension explores opportunities to reduce waste, improve efficiency, and support repair and reuse, reinforcing sustainability as a practical component of craft valorisation.

Methodological framework and ethics

To design, assess, and communicate impact, the pilot adopts the Europeana Impact Framework, selected for its suitability to digital cultural-heritage initiatives and its alignment with CRAEFT's objectives. The framework structures work across: (i) impact design, (ii) impact measurement, (iii) impact narration, and (iv) evaluation and reflection. Data collection follows a mixed-methods approach combining interviews, surveys, observations, workshops, and visual documentation, complemented by secondary sources from project archives. Ethical and legal requirements are addressed through informed consent, accessibility and cultural sensitivity measures, and GDPR-aligned data protection, including additional safeguards when engaging children and diverse communities.

Results and contribution

Across the portfolio of use cases, evaluation evidence indicates that digital augmentation—when designed to be usable, respectful, and context-aware—can increase engagement and learning, strengthen cultural connection, and improve visibility for practitioners and local organisers. Importantly, several outputs were tested not only in initial deployments but also through utilisation-based replications (external users applying the same framework in different contexts), providing

evidence of transferability and highlighting concrete refinement needs typical of adoption beyond the originating team.

Overall, the deliverable demonstrates that the CRAEFT Valorisation Pilot translates interdisciplinary research into actionable outputs that support (i) safeguarding and transmission of intangible cultural heritage, (ii) new professional and economic opportunities, and (iii) EU objectives for digital transition, sustainability, and knowledge valorisation. By documenting both the process and the outcomes, it serves both as a project report and as a reference model for future initiatives seeking to valorise craft heritage through ethically grounded, digitally informed, and practitioner-centred approaches.

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Abbreviations

API	Application Programming Interface
APK	Android application package (installation file)
CE	CE marking (Conformité Européenne)
CH	Cultural Heritage
CSS	Cascading Style Sheets
CSV	Comma-Separated Values
GI	Geographical Indication
GPSR	General Product Safety Regulation
ID	Identifier
IP	Intellectual Property
JSON	JavaScript Object Notation
LVMH	Moët Hennessy Louis Vuitton
NFC	Near Field Communication
NFT	Non-Fungible Token
PBIS	Product Biography Information System
SP	Strategic Perspective
SUS	System Usability Scale
TCE	Traditional Cultural Expression(s)
TK	Traditional Knowledge
UI	User Interface
URL	Uniform Resource Locator
VL	Value Lens

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1 Introduction

Craeft is a project under the Horizon Europe research and innovation program, dedicated to exploring craft-making as a dynamic interplay between cognition, sensory perception, and physical action. It seeks to capture and computationally model the intricacies of human creativity, employing formal knowledge representation to safeguard and analyse these processes. To support craft practitioners, Craeft develops tailored tools and leverages generative simulations and virtual imagery to assess abstract concepts and enhance learning and workflow optimisation.

A key component of this research is the Valorisation Pilot, led by the Piraeus Cultural Foundation (PIOP), a non-profit organisation committed to preserving and promoting Greece's craft and industrial heritage. This pilot highlights how digital technologies can enhance the value and appeal of craft objects, enabling craft practitioners to effectively expand their reach without compromising the authenticity or individuality of their creations. More precisely, the Valorisation pilot is a core component of the project's effort to ensure that craft products and practices remain culturally significant, economically viable, environmentally friendly, and technologically adaptable.

The idea of valorisation extends beyond financial gain, encompassing the cultural enrichment of craft traditions through innovative approaches to sharing and engagement. Historically, craftsmanship has been deeply intertwined with human development, shaping societies through material culture, artistic expression, and the transfer of community-based knowledge. However, with the advent of industrialisation and mass production, many traditional crafts have faced marginalisation and decline, with their practitioners struggling to sustain livelihoods in increasingly mechanised economies. Furthermore, as digital technologies transform various sectors, craft-related professions risk being overshadowed unless they find new ways to engage with modern audiences and effectively market their products. By integrating methods like immersive cultural experiences, interactive craft-based games, and AI-driven narratives about craft products, the project ensures that traditional craft knowledge is not only preserved but also dynamically integrated into modern cultural and economic landscapes.

In this way, Craeft seeks to foster a deeper appreciation and sustainable future for traditional craftsmanship through the integration of digital tools, innovative valorisation strategies, and interdisciplinary research methodologies. Rooted in the recognition that craft knowledge is an invaluable aspect of cultural heritage, Craeft aims to preserve, promote, and expand its relevance in contemporary contexts by engaging with new audiences, enhancing practitioner visibility, and introducing novel economic opportunities.

1.1. Dimensions

To this end, in this work, we focus on the following dimensions of valorisation:

1.1.1 Experiences

The experiences aim to facilitate onsite and distance learning from practitioners and/or related institutions for a wider audience. Furthermore, they are integrated in introductory crafting experiences for thematic and cultural tourism, where craft objects and local culture are also promoted through

realistic online previews, contextualisation content, and guides to craft-related thematic tourism destinations. These advances not only disseminate and preserve local craft knowledge but also enhance the practitioner's tools to promote their work and activities.

1.1.2. Games

Enhanced craft-related digital and physical games and toys target advanced game structures to become more socially inclusive by digitising and generating visual content, immersing players in craft-specific knowledge, and proposing DIY craft practices for manufacturing game sets. Some digital game experiments explore the simulation and transfer of knowledge from craft's tacit knowledge and material manipulation.

1.1.3. Retail

The retail dimension investigates valorisation opportunities through services, marketing digital assets and designs, and consultation. This is achieved through a digital marketing tool for craft products contextualisation that presents stories in multiple formats. The content is designed around product authentication and marketing, and thus includes information about its creator, origin, production method, retail, and circular economy information.

1.1.4 Makers

Makers derive through the activities of the games' dimension, and more precisely, mould making practices. Mould making is a common procedure for several crafts, including porcelain making, yet it differs in material composition. By experimenting with digital technologies and a variety of materials, this dimension aims to exemplify the economic and environmental benefits of using DIY moulds to reduce material waste, develop efficient workflows, and consider repair instructions.

1.2 Pilot KPIs

1.2.1 WI1: Bring together traditional know-how with digital technologies for new products, services and professions

Target Value (#)	Verification	Achieved by Craeft
Artefacts with digital dimensions > 50	Development (P2). Verification & Valorisation (P3).	Craeft developed and validated more than 50 craft-related artefacts enhanced with digital dimensions, including mobile applications, interactive learning materials, 360° tours, VR experiences, digital games, and digitally contextualised craft products across the Experiences, Games, Retail, and Makers dimensions.

New products > 100	Development (P2). Integration & verification (P3). Valorisation (P4).	Over 100 new products were generated through Craeft activities, including digitally augmented craft products, educational games, digital cultural experiences, interactive applications, and hybrid physical–digital artefacts, integrating traditional craft knowledge with contemporary digital technologies.
New services > 5	Tutoring and crafting services as (P2). Valorisation (P4).	Craeft introduced more than five new services, such as digital tutoring and distance learning for crafts, interactive museum experiences, digital storytelling and provenance services for retail, craft-based educational workshops, and consultancy models combining craft expertise with digital tools.
New professions >4	Defined in P1. Validated in P2. Valorised in P4.	The project identified, validated, and valorised at least four emerging professional profiles, including roles at the intersection of craft practice, digital heritage, interactive experience design, digital craft education, and cultural technology mediation.

1.2.2 WI3: Revive, valorise and foster TC techniques and combine them with emerging cutting-edge technologies.

Target Value (#)	Means of verification	Achieved by Craeft
TCs studied ≥ 8	Represented in WP1 & WP2. Employed in education & training (P1). New products (P2). Valorisation & communication (P4).	Craeft studied and documented more than eight traditional craft techniques, including silversmithing, glassmaking, pottery, wood carving, tapestry, porcelain, textile crafts, and papier mâché, which were subsequently employed in education, product development, and valorisation activities.
Craft products >100; valorised > 10	Created in P2. Valorised in P4.	More than 100 craft products were created or enhanced through Craeft, with at least 10 explicitly valorised through digital storytelling, authentication, retail contextualisation, exhibitions, and dissemination activities targeting wider audiences.
Craft products fusing TC & digital fabrication >20	Tested (P2). Communicated (P3). Valorised (P4).	Over 20 craft products and prototypes combining traditional techniques with digital fabrication, simulation, or digital design tools were developed, tested, communicated through pilot activities, and valorised via exhibitions, digital platforms, and stakeholder engagement.

1.3. Contribution

The European Union is committed to amplifying the social and economic impact of research and innovation across Europe by valorising knowledge and ensuring that research outcomes are effectively integrated into society. This ambition is central to tackling societal challenges and driving progress in green and digital transitions. Knowledge valorisation, the process of converting knowledge into tangible social and economic value, bridges diverse sectors and transforms research findings, expertise, and data into sustainable products, services, and evidence-based policies. The EU's approach encompasses both technological and non-technological innovations, engaging all stakeholders in a collaborative ecosystem.

Craeft's Valorisation pilot aims to complement those efforts by enhancing and evaluating the added value of existing technologies and strategies of its partners, and suggesting new uses and services for the immediate stakeholders of the project (i.e. craftspeople) and related audiences. This is pursued through its four dimensions, addressing aspects of experiences, games, retail, and making processes. Each dimension is unique to activities related to craft and contributes to wider impact areas such as social, economic and environmental.

Below is paste-ready text you can place **at the end of Section 1 (Introduction)** as a "reader's guide". It is written to be generic enough to remain correct even if minor subsection numbering shifts, while still mapping the document structure clearly.

1.4 Guide to the document

This deliverable reports Pilot 3 (P3) valorisation activities, methodology, and results, and is organised to help the reader move from context, to implementation, to evidence and interpretation.

- **Section 2 (Background and related work)** provides the conceptual and practical context for the work reported in this deliverable. Its subsections summarise prior approaches and relevant practice in cultural-heritage experiences, games and learning interventions, retail-support tools, and maker-culture initiatives, as well as impact-oriented evaluation approaches. This background is used to motivate and frame the contributions presented in the subsequent sections.
- **Section 3 (Methodology)** describes the methodological approach used across P3. It outlines how use cases were selected and scoped, how data were collected (e.g., surveys, interviews, observations, and utilisation exercises), and how results were analysed. It also describes the impact-assessment approach adopted for synthesising outcomes across heterogeneous activities.
- **Sections 4-7 (Use cases)** constitute the core reporting of P3 activities, organised by contribution area:
    - **Section 4 (Experiences)** presents digital experience-oriented use cases (e.g., mobile and web experiences, virtual tours, and related demonstrators), including their objectives, implementation characteristics, and evaluation evidence.
    - **Section 5 (Games)** reports game-based and gamified use cases designed to support engagement, learning, and craft valorisation, together with their evaluation outcomes.
    - **Section 6 (Retail support)** presents the retail-support use case, focusing on requirements, implementation, and evaluation as a tool for market-facing craft stakeholders.
    - **Section 7 (Maker culture)** reports activities targeting maker communities and DIY participation, including how these were implemented and assessed.

- **Section 8 (Results)** synthesises outcomes across the use cases. It consolidates evidence using an impact framework to report results by strategic perspectives and value lenses, and highlights cross-cutting findings, strengths, and limitations.
- **Section 9 (Discussion)** interprets the findings in relation to the deliverable objectives and to relevant practice. It discusses implications for valorisation, transferability, and scalability, and identifies priorities for future refinement and longer-term impact assessment.

Annexes provide supporting material required for traceability and reuse, including evaluation instruments and surveys, scenario descriptions, technical documentation and workflows for specific tools, and additional assets.

References provide the sources cited throughout the deliverable.

2 Related Work

This section situates the work of Deliverable D6.3 in the context of existing practice and prior research, and establishes the conceptual and methodological foundations used throughout the remainder of the document. Rather than attempting an exhaustive survey, it highlights the specific strands of work that directly inform the design choices, evaluation approach, and impact framing of the contributions reported in the subsequent sections.

The subsections of Section 2 are organised to mirror the main contribution areas that follow. They review: (i) cultural-heritage experiences and digital visitation formats, including mobile, web, and immersive modalities; (ii) games and gamified approaches used for cultural mediation, learning, and engagement; (iii) digital support for craft-oriented retail and market-facing activities; (iv) maker culture and DIY ecosystems relevant to craft transmission and community participation; and (v) impact-oriented approaches and assessment frameworks used to reason about outcomes beyond technical performance. Collectively, these backgrounds provide the context against which the methodologies (Section 3), use cases (Sections 4–7), and results and discussion (Sections 8–9) can be interpreted.

2.1 Experiences

In contrast to economics, an object biography aims to reveal hidden aspects of an object's life and development that refer more to transmission than productivity and commodification [34, 38].

In the field of economics, a turn has been the notion of servitisation, which focuses on the offering of services rather than just products [30]. These services are not only considered a business but also aim to complement the physical product. A product biography includes its design, production, circulation, consumption or use, and end of life. An additional service to the product would be customer or repair support, adding to another product's life cycle [31]. Nevertheless, Mont [33] observes that, in today's globalised world, consumption of such services might be more expensive than buying a new product because they usually constitute labour-intensive work.

Living in the Anthropocene, where global recognition of the inextricable connection of human activity and environmental impact holds a significant place, it is more relevant than ever to talk about the multiple lives of objects. Circular economy supports this plurality through the maintenance, reuse, and recycling of products. Whereas a classic product biography can be viewed as a linear process, a circular product biography includes loops of use.

Moreover, consumption habits and intentions are activities that further impact our lives [28, 29]. Mont [33] mentions that 'although improving [technological] efficiency of products and processes makes environmental sense, it is not enough to combat the scale of problems we face. Special attention should be given to current consumption levels and patterns. Morone et al. [32] researched consumer intention based on a product's presence and absence of bio-based certification. They showed that making a certification visible is a good management practice to communicate a product's background, but the prices should also become more elastic and attractive for consumers to adopt sustainable habits. Chang and Wildt [37] further suggest that purchase intention relies on direct product information because it influences the perceived price and quality of a product.

Craeft's new online form proposes a combination of the previously mentioned biographies and takes into account consumer habits and improvements. In other words, it suggests a culturally informed craft product biography that will enhance and increase the information provided to consumers. Craft products are usually esteemed for their uniqueness because of their handwork and environmentally friendly practices. Nevertheless, new business models and practices are under research (see, for example, the European-funded project HEPHAESTUS), and often against global industrial production. Craeft's online form aims to contribute to the marketing of craft products, specifically their descriptions.

Technologically, the form's layout draws from the Product Biography Information System (PBIS), which generates a holistic product biography not only from raw material to end product but also by gathering third-party data after the product leaves the industrial facilities [39]. Furthermore, it takes into account suggestions about influential words and categories that were discovered after AI-driven product description mining of online stores [36, 71]. Narrative generation is affected through the use of AI tools, such as ChatGPT and Gemini. CNR partners have recently investigated the possibility of integrating large language models (LLMs) into workflows using semantic web technologies to generate narratives [27]. This is a feature that would be further explored to include in CAP in the future.

2.2 Games

2.2.1 Gamification and Cultural Preservation

The concept of gamification, or embedding the mechanics and motivational structures of games into non-game contexts, has gained traction in CH. Its value lies in encouraging exploration, repetition, and mastery. Kang et al. [3] provide a notable example in their study of bamboo papermaking, where gamified learning was applied to the dissemination of ICH. Their work demonstrates that gamification can replicate the progressive difficulty and feedback cycles that characterise craft apprenticeships, thereby offering a framework for skill acquisition outside traditional master-apprentice relationships. They argue that gamification does not trivialise heritage; instead, it creates accessible gateways that stimulate curiosity while preserving the integrity of the knowledge transmitted.

Varli et al. [8] extend this perspective into architectural and CH education, showing how game-based strategies can move learners beyond passive reception towards embodied experience. Their findings highlight the role of interactivity: when cultural narratives are staged as systems of decision-making and consequence, learners develop a deeper and more situated understanding of the heritage in question. A complementary line of inquiry is seen in Phongsophol et al. [6], who investigate how gamification enhances virtual museum visits. By embedding quests, achievements, and rewards into digital exhibitions, they demonstrate improvements in visitor engagement, particularly among tourists. The study reinforces the idea that gamification entertains and structures attention, thereby ensuring that visitors engage with educational content that might otherwise be overlooked.

These works underscore an important limitation: most implementations remain digital-only. By contrast, many traditional crafts are inherently tactile, grounded in material interactions that are difficult to convey through screens alone. This work addresses this gap by exploring how analogue board games, complemented by digital adaptations, can provide a hybrid model that retains tactility while benefiting from the scalability of virtual environments.

2.2.2 Educational Board Games

A second body of literature concerns the use of board games as pedagogical instruments. Mendes and Correia [5] conducted a systematic review of board, tabletop, and analogue game-based learning approaches, concluding that such media are particularly effective in supporting collaboration and situated practice. Their review catalogues a wide range of educational deployments, from mathematics to environmental science, highlighting the versatility of analogue games as learning environments.

Bayeck [1] goes further in defending the relevance of board games in the digital age, arguing that their value lies not in competing with video games but in offering distinctive affordances. Physical components, shared space, and face-to-face interaction generate a learning ecology that is not fully replicated by digital systems. In this view, board games create 'interaction laboratories,' where players externalise strategies, negotiate rules, and collectively reflect upon consequences. Lin et al. [4] tested a technology-enhanced board game in the context of primary mathematics education. Their findings show improvements in academic achievement, motivation, and engagement. This suggests that the learning gains from board games derive as much from their affective qualities, i.e. enjoyment, competition, and collaboration, as from the explicit content they deliver.

For this work, these insights are crucial because they indicate that board games can function as embodied learning environments, where complex artisanal processes are explained and enacted. At the same time, they caution that success depends on balance: a board game must be engaging as a game while carrying educational value, lest one function undermine the other.

2.2.3 Traditional Crafts Gaming

The third strand of literature is smaller but directly aligned with the objectives of Crafts: the use of games to teach traditional craft practices. Here again, Kang et al. [3] provide a touchstone, as their bamboo papermaking case exemplifies the application of gamified mechanics to the safeguarding of artisanal skills. Other examples extend beyond strict craft training. Sulaiman and Samsudin [7] examine the design of children's traditional games through visual thinking in socio-cultural contexts. While their focus is not on craft techniques per se, their findings highlight how traditional play embodies cultural knowledge and how its careful design can promote continuity between generations.

Camuñas-García et al. [2] address heritage-based video games more broadly, analysing their potential for heritage education. They argue that digital game environments can effectively model artisanal practices, provided they retain narrative and contextual authenticity. Their analysis shows potential and pitfalls: while video games can capture attention, they risk oversimplifying craft practices unless grounded in rigorous documentation.

2.3 Retail

2.3.1 Labelling and Protection in Traditional Crafts

Labelling in the traditional crafts sector serves a multifaceted purpose that extends well beyond simple product identification. Its primary aim is to ensure authenticity and provenance, providing consumers

with verifiable information regarding a product's origin, materials, and the processes involved in its creation. Effective labelling acts as a crucial tool in protecting traditional crafts against counterfeiting and cultural appropriation, safeguarding both the integrity of the craft and the rights of its creators [53]. Furthermore, it facilitates market access by building consumer trust and distinguishing genuine handcrafted products from mass-produced imitations. Ultimately, labelling plays a vital role in ensuring fair compensation and equitable benefit-sharing for artisans and their communities, recognising the significant economic and cultural value embedded in their work.

2.3.2 Traditional Craft Intellectual Property (TCIP)

Traditional Craft Intellectual Property (TCIP) refers to rights associated with creations originating from long-standing cultural practices and skills. This designation encompasses a wide array of tangible and intangible expressions, ranging from handcrafted textiles and pottery to traditional songs and stories intimately linked to a specific community or heritage. The meaning here is deeply rooted in the cultural significance and historical context of these crafts, rather than solely in their commercial value. In its simplest form, TCIP acknowledges the rights connected to creations born from enduring cultural skills and traditions.

The applications of TCIP in sustainability are diverse. They include using Geographical Indications (GIs) to protect the origin and quality of craft products, implementing certification schemes to promote ethical and environmental standards, and developing community-based IP management systems. These measures support fair compensation for artisans, preserve traditional skills, and promote the use of sustainable materials and production processes. Additionally, these protections can attract investment in craft-based enterprises that support local economies and reduce environmental impact. Recognising and safeguarding this property is crucial for preserving cultural identity and supporting sustainable livelihoods within craft communities. These protections ensure that artisans can benefit economically from their creations and maintain control over their cultural expressions. It is about acknowledging that these crafts are not merely commodities but carriers of identity, knowledge, and communal history.

The intention behind TCIP is not to impose rigid Western IP laws directly onto these traditions, but rather to find ways to safeguard them from misappropriation and ensure that the custodian communities benefit from their continued practice and commercialisation. Customary laws, community protocols, and defensive strategies, e.g. databases for patent examiners and licensing agreements, play a critical role in managing and protecting Traditional Knowledge (TK) and cultural expressions. These mechanisms emphasise self-determination and help prevent the misappropriation of intellectual property related to TK. Defensive protection ensures that communities retain control over their heritage, while contracts and licensing agreements enable fair benefit-sharing in commercialisation efforts. Ethical guidelines and soft law further promote responsible practices in handling TCIP, ensuring respect for traditional crafts [53].

2.3.3 Regulatory Landscape

The European Union’s regulatory landscape for craft products is evolving, introducing both new protections and stricter compliance requirements. Key regulations, such as the General Product Safety Regulation (GPSR) and CE Marking, remain foundational for market access, alongside material-specific labelling for textiles and precious metals. The EU Geographical Indication (GI) for Craft and Industrial Products provides powerful tools for safeguarding unique creations and traditional knowledge [54]. Its is complemented by collective marks, certification marks, copyright, and design rights.

Geographical Indications (GIs) protect products tied to specific regions, ensuring quality and reputation, while collective and certification marks (e.g., Craftmark India, WOOLMARK) verify authenticity, ethical production, and adherence to community standards [55, 56]. However, copyright law often fails to adequately protect Traditional Cultural Expressions (TCEs) due to its focus on individual authorship and limited duration, which conflicts with the communal and intergenerational nature of TK [53]. To address these gaps, TK Labels have emerged as a community-driven initiative, allowing Indigenous groups to define the terms of engagement with their cultural heritage. These labels serve as both an educational tool and a protective measure, ensuring that non-community users understand the significance of TK and respect its governance structures [57].

Despite these advancements, the legal vulnerability of TCEs persists, particularly when works enter the public domain, making them susceptible to misappropriation. The WIPO Intergovernmental Committee has recognised the need to exclude TK and TCEs from the 'public domain' to prevent exploitation, underscoring the importance of alternative, culturally appropriate protection mechanisms that align with community rights and values.

2.3.4 Technological Innovations

Blockchain technology and NFTs are revolutionising the authentication and traceability of traditional crafts and luxury goods. Blockchain's decentralised, tamper-proof ledger ensures transparent and immutable records of a product's lifecycle, from raw materials to ownership transfers, making it highly effective against counterfeiting. Each transaction is cryptographically linked, creating a secure chain that consumers can verify, such as through platforms like LVMH's AURA, which assigns digital certificates to luxury items [58]. NFTs further enhance this by serving as unique digital certificates of authenticity, enabling traceability and automating royalty payments via smart contracts [59].

Studies demonstrate blockchain's practicality in verifying GI-tagged crafts, where QR codes linked to blockchain records provide artisans with market access and build consumer trust [60]. To bridge the physical-digital divide, QR codes and NFC tags are integrated with blockchain, creating a 'phygital' authentication model. These technologies allow consumers to scan products and access detailed provenance, crafting processes, and artisan stories, enhancing transparency and engagement [61, 62]. However, conventional anti-counterfeiting measures like QR codes and holograms are vulnerable to replication. Advanced solutions, such as Quantum Base's Q-ID Optical tags, use atomic-level quantum signatures to create unclonable identifiers, providing robust protection for high-value crafts [63]. These innovations are essential for addressing the growing sophistication of counterfeiting, ensuring that both digital and physical authentication layers remain secure and trustworthy.

2.3.5 Challenges and Future Directions

A core challenge in labelling traditional crafts arises from the fundamental mismatch between Western intellectual property frameworks, i.e. copyright and patents, and the nature of TK and TCEs. Western IP systems prioritise individual ownership, novelty, and commercialisation, while TK and TCEs are often communally owned, intergenerational, and non-commercial, sometimes encompassing sacred or cultural uses. This disparity leaves them vulnerable to exploitation, as existing IP mechanisms fail to accommodate their unique characteristics. The World Intellectual Property Organisation (WIPO) has acknowledged this issue, advocating for the exclusion of TK and TCEs from the 'Public Domain' to prevent unjust enrichment [53].

Effective labelling must go beyond authentication to ensure fair compensation, equitable benefit-sharing, and ethical production for artisan communities. While many IP frameworks assume commercial intent, protecting TCIP, even in non-commercial contexts, remains a challenge. Initiatives like Craftmark India demonstrate how labelling can integrate ethical considerations, ensuring fair wages and safe working conditions. However, authorship, novelty, and formal registration pose significant hurdles for TK, which is often unwritten, orally transmitted, or collectively created. Although GIs offer a more suitable tool for some crafts by linking quality to origin, they may still overlook cultural protocols. The goal is to develop flexible, culturally appropriate mechanisms that protect TK from misappropriation while respecting traditional governance structures [53].

Despite the potential of emerging technologies like blockchain, QR codes, and NFC, their adoption in traditional crafts faces practical barriers, including cost, infrastructure limitations, and digital literacy gaps among artisans. Resistance from traditional institutions and the need for user-friendly, scalable, and interoperable systems further complicate implementation [62, 63]. A truly advanced labelling system must holistically address authenticity, provenance, collective rights, cultural integrity, and equitable benefit-sharing. Tools like TK Labels prioritise cultural heritage preservation, fair compensation, and sustainable livelihoods, recognising crafts as living cultural expressions rather than mere commodities. This approach ensures that labelling strategies align with the ethical and legal dimensions of TK and TCEs, fostering both market protection and cultural preservation.

Future labelling strategies should prioritise harmonisation and interoperability among diverse legal frameworks, including GIs, collective marks, and sui generis protections tailored for TK and TCEs. Inspired by community-centric models, new legal frameworks should better accommodate communal ownership and the intergenerational transfer of knowledge. International cooperation, potentially led by organisations like WIPO, is crucial to establishing global standards that respect and protect the multifaceted nature of traditional crafts. The adoption of blockchain-based systems should be expanded to ensure immutable provenance and traceability, complemented by user-friendly QR codes and NFC tags for seamless consumer access. Investing in advanced anti-counterfeiting technologies, such as physically unreplicable identifiers, will further secure traditional crafts, creating a robust 'digital twin' that enhances consumer trust.

Support programs are essential to empower artisans with knowledge of intellectual property rights, digital tools, and market dynamics. Initiatives that provide direct market access and reduce intermediaries will ensure artisans retain a greater share of value. Training in digital literacy, e-commerce, and modern labelling technologies will further strengthen their market presence. Finally, public awareness campaigns should educate consumers about the cultural significance, ethical production, and authenticity of traditional crafts. By highlighting the stories behind the products and artisans, these campaigns can foster a market that values genuine, ethically sourced, and culturally respectful crafts.

2.3.6 The Craeft Initiative

To address some of the aforementioned aspects, Craeft created a content collection form to digitally contextualise craft products and provide the possibility to present them through varying channels to highlight their authenticity and enhance their marketing opportunities. The online form includes text, images, video, sound, and other media. Once the content is uploaded by the users, the result is an online narrative for the object that would be generated by scanning the object or a QR code with a mobile camera. The craftsperson also has choices on how the resulting narrative will look, i.e. as a text narrative

with media (third-person narrative), as a biographical object (first-person narrative), or as a podcast (sound narrative; inclusive for visually impaired people), or a combination of the above. The narratives use AI generative tools for easier use and parallel authorship inspection.

2.4 Maker Culture

Maker culture is understood as a technology-driven evolution of DIY, where digital tools extend the maker's ability to design, simulate, and control form in preparation for fabrication. The maker movement's open and sharing-oriented ethos further supports uptake, transfer of know-how, and community learning. Within craft contexts, a particularly relevant role of digital manufacturing is the production of intermediate tooling (rather than finished goods), because tooling can be reused, adapted, shared, and combined with familiar hands-on processes.

Maker Culture is a technology-driven evolution of the DIY ethos. In this context, Digital Manufacturing (DM) is viewed as an extension of craft, primarily because a deep understanding of traditional craft remains indispensable for the technology to be effectively capitalised upon [44]. Digital tools function as extensions of the artisan's intellectual capacity, allowing them to control geometric systems and environmental simulations in preparation for digital fabrication [43].

The integration of DM tools into the craft sector is facilitated by the influence and infrastructure provided by the Maker Movement, which fosters a significant shift in the artisan's professional development. The open-source philosophy of the Maker Movement is fundamental to knowledge transfer, as it actively encourages the sharing of designs and knowledge (UK government, 2025). Furthermore, digital technologies offer the potential to augment tasks that require abstract reasoning skills, high-level interpretation, and design thinking [40].

The primary application of DM is the production of intermediate tooling rather than the fabrication of finished goods, providing the framework for engineering innovations, including optimising material properties and realising new applications [41]. DM enables the rapid production of tooling and fixtures, thereby optimising production and reducing operational downtime. Using DF for producing moulds and patterns makes small-scale casting economically viable while simultaneously reducing material waste. Consequently, the general educational level of workers capable of learning these hybrid tools is increasing [42].

Aligning with these principles, Craeft embraces the Maker Movement's ethos by focusing on digital manufacturing as a means to create intermediate tooling, such as moulds, rather than solely finished goods. This approach is practically applied in the project through the creation of 3D-printed moulds for a chess set, serving as a demonstrator for how digital designs can be transformed into tangible artefacts using accessible methods. By bridging high-tech fabrication with hands-on crafting using everyday materials like soap and wax, this initiative aims to democratise production knowledge and encourage makers to explore the fertile intersection of modern technology and traditional heritage.

2.5 Impact

Craeft's Valorisation pilot builds on the concept of adding value to craft practitioners' activities. This value is viewed from multiple complementary perspectives. We used an impact framework to map the aims and

results of the pilot. To select the appropriate framework, we review existing impact frameworks relevant to our goal. More detail is paid to the Europeana Impact Framework that we selected for this mapping task.

2.5.1 Frameworks

There are several existing impact frameworks and assessment tools, some with payment requirements and others available for open access. For our purposes, we will examine open-access frameworks and tools to understand their focus and what they offer. Defining impact areas can be challenging and is not a task that we will undertake in the scope of this project and pilot. The following frameworks were selected to exemplify existing impact pathways from frameworks that relate to social and cultural issues. Those are the Impact Canvas, the Social Impact Toolbox, and the Centre for Cultural Value.

The Impact Canvas (n.d.) originated in 2014 in New Zealand and has since evolved through collaboration with numerous individuals, teams, and organisations [10]. Its development was initially inspired by a youth mental health social lab, where working with young people revealed recurring needs, such as guidance in group processes, problem definition, and validating strengths. Additionally, while co-founding the Zero Carbon Challenge, an accelerator for climate-focused startups, the creators noticed a gap in resources for impact strategy compared to the abundance of startup materials. The tool's refinement was further shaped during the establishment of Generation Zero, where developing a theory of change highlighted the value of aligning organisational strategy to amplify impact. As the organisation evolved, the Impact Canvas helped clarify its focus, communicate priorities, and contribute to significant achievements, including the passage of New Zealand's Zero Carbon Bill into law.

Precisely, the Impact Canvas tool helps define an organisation's impact strategy and define its assumptions. It is divided into seven sections that can be worked on linearly. 'Assumptions' invite the participants to think about what they believe, where the problem exists and what can be done to resolve it. 'Problem definition' helps with finding the cause of the problem and what leads to it. The 'History' tool facilitates a deeper exploration of social issues by enabling participants uncover their origins and how they have evolved. This process provides crucial context for understanding the factors that have contributed to the identified problem. 'Vision' is an exercise to look into the future and practically think about the milestones that can indicate success. 'Ecosystem' is a mapping process identifying who else is working on the same problem and considering possible collaborations. 'Unique strengths' help identify what is unique about the organisation's practices and where they can contribute more than others. Last, 'Experiments' is a concluding section where, based on the answers of the previous sections, an activity can be designed.

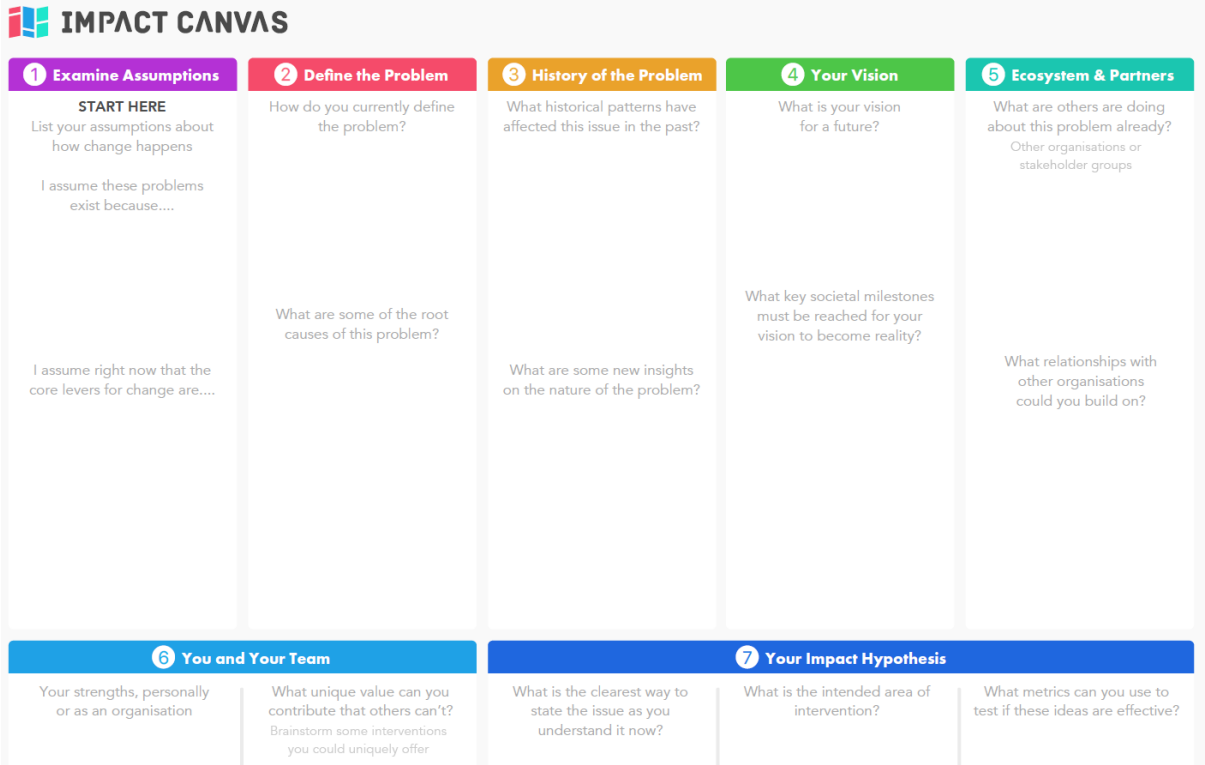


Figure 1. Impact Canvas tool.

In a similar concept, the Social Impact Toolbox [13], developed by the Business School of the University of Technology, Sydney, started in 2019 as an open-access website with impact-related resources, such as templates and tools, as well as digital courses, to measure social impact. Their framework starts with identifying the social issues and problems, developing a theory of change, including a correlation of activities and outcomes, planning and implementing an evaluation of the activity, and last, reflecting on the results and improving future content. This framework, as the Impact Canvas, targets organisational change and therefore begins the impact journey by defining issues and problems.

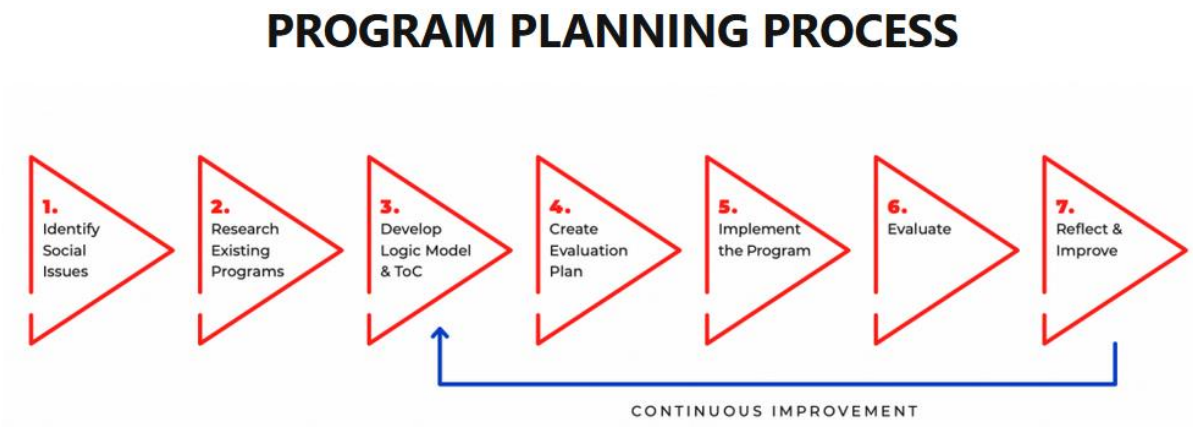


Figure 2. UTS Social Impact Toolbox program planning process. Image source: https://www.culturalvalue.org.uk/our-work/evaluation/evaluation-principles/

In a more cultural context, in 2012, the UK's Arts and Humanities Research Council launched the Cultural Value Project [12], to explore why arts and culture matter and how their impact can be measured. Through 70 original works the project advanced understanding of cultural value, emphasising the importance of personal engagement with arts and culture. A follow-up 2018 report by Patrycja Kaszynska highlighted the need for cross-sector collaboration, leading to the establishment of the Centre for Cultural Value in 2019.

The Centre conducts research reviews and evaluations to inform policy and create resources that other stakeholders can use. Their evaluations are based on the Evaluation Principles that were developed through co-creation sessions with representatives of the cultural sector. Those principles are:

- Beneficial: invites organisations to think about the direct stakeholders, or audience, of their activities, rather than funders.
- Robust: reminds us to make strong case studies with different methods that will help find out the 'why' and 'how', rather than just the 'what' happened.
- People-centred: points out the need for better representation of the cultural sector, including inclusiveness and equality of viewpoints and voices.
- Connected: makes sure that reports and dissemination activities are transparent and truthful to those they represent (Centre for Cultural Values 2025).

Figure 3. Evaluation Principles. Centre for Cultural Value. Image source: https://www.culturalvalue.org.uk/our-work/evaluation/evaluation-principles/

These frameworks and concepts offer a general logical pathway and principles that organisations can consider when planning their activities to make sure they maximise their impact on their stakeholders. For Craeft, a more specialised framework was used to frame and articulate the activities of the Valorisation pilot.

2.5.2 Europeana Impact Framework

We selected Europeana's Impact Framework to frame the activities of the Valorisation pilot, design some of them and evaluate most of the pilot's efforts [9]. The choice was based on the fact that this framework consists not only of theory but also has practical tools to facilitate collaborative workshops within the consortium, as well as with stakeholders when needed. Furthermore, the framework has been developed for cultural heritage and, more precisely, with digital cultural heritage in mind. This corresponds with Craeft's mission to use digital tools to valorise traditional craftsmanship. This subsection provides a general overview of Europeana's Impact Framework and its tool, the Europeana Impact Playbook (Europeana Pro n.d.), and how it is used in Craeft for the Valorisation pilot.

The Europeana Impact Framework [9] and Playbook are built on Simon Tanner's Balanced Value Impact (BVI) Model [72], developed to assess the impact of digital collections. Tanner's research highlights the challenge of measuring impact due to the relatively short existence of digital resources and the lack of long-term evaluation. The BVI Model defines impact as measurable outcomes demonstrating changes in the lives or opportunities of communities due to digital resources. It outlines a five-stage process: setting the context (assessing organisational, stakeholder, and societal benefits), designing the framework (analysing stakeholders and defining criteria), implementing the framework, narrating outcomes, and reviewing/responding for future improvements. Tanner emphasises the importance of time and social interaction between digital resources and their users, aligning with the Europeana Foundation's mission to evaluate the impact of cultural heritage data across diverse stakeholders.

The Europeana Impact Playbook defines impact as the changes experienced by stakeholders or society due to an organisation's activities, recognising that long-term impact is challenging to attribute directly. Instead, it focuses on short- and medium-term impacts, which are easier to measure and create a ripple effect, where each change sets the stage for further transformations. While long-term impact can be studied, it requires extended, iterative measurement. The Playbook is structured into four flexible phases: Impact Design, Impact Measurement, Impact Narration, and Evaluation. Users can adapt the process to their needs, leveraging instructions, templates, and webinars to learn by doing. Below is a presentation of the phases and their main tools.

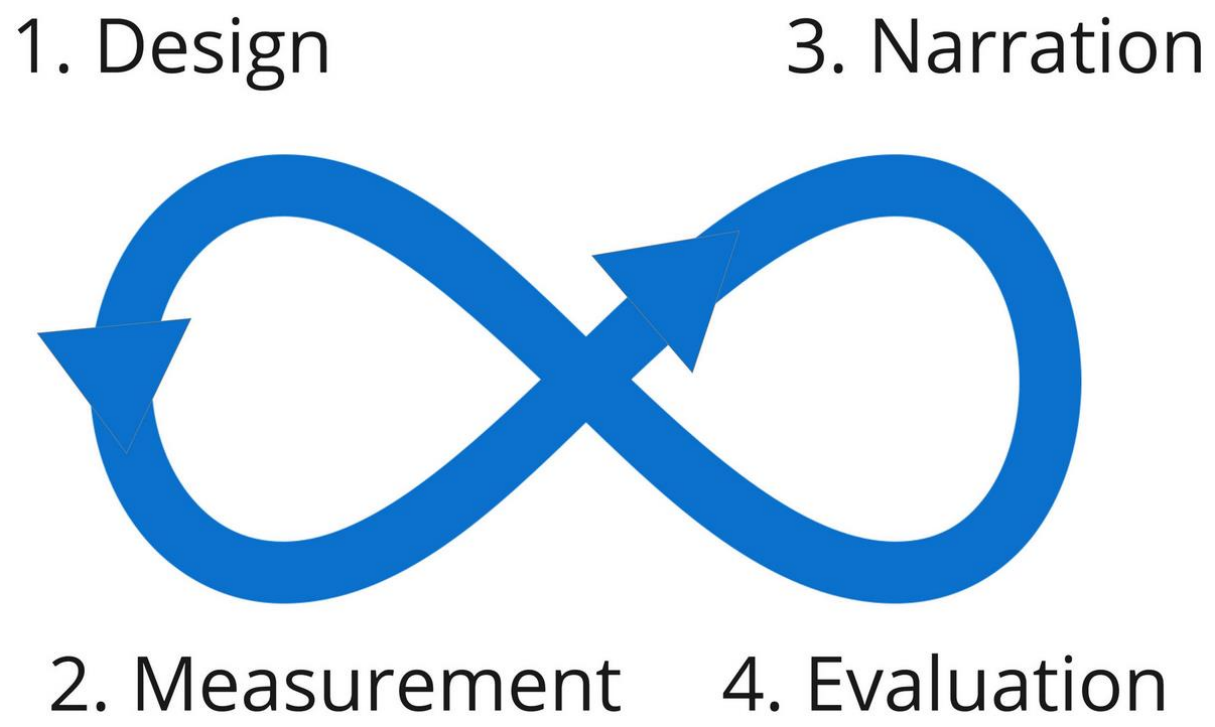


Figure 4. The four phases of the Europeana Impact Playbook

Phase one - Impact design

This phase of the Europeana Impact Playbook aims to introduce impact terminology and guide users in planning impactful projects. It involves deciding when to assess impact (before, during, or after the

project) and evaluating the team's skills. Users define the desired impact, stakeholders, outcomes, activities, outputs, and resources, focusing on short- and medium-term measurable outcomes.

To identify stakeholders, the Playbook suggests a stakeholder mapping workshop using a prioritisation matrix (important/unimportant vs. direct/indirect). An Empathy Map helps teams understand stakeholders' needs, perspectives, and challenges. The Strategic Perspectives tool, inspired by the BVI Model, frames impact across economic, environmental, social, operational, and innovative dimensions, emphasising long-term outcomes beyond direct accountability.

Outcomes are prioritised based on materiality (significance of change) and accountability (responsibility for change). A Change Pathway visually distinguishes between outcomes the organisation can directly influence and those it cannot. Finally, the phase balances qualitative outcomes and quantitative outputs, ensuring alignment with available resources and proposed activities.

All tools, terms and definitions can be found in Annex A.1.

Phase two - Impact measurement

Phase Two focuses on planning how to measure the impact defined in the Change Pathway. This involves determining the scale, indicators, and data collection methods, while ensuring the team has the necessary skills, or considering outsourcing or collaboration if needed.

First, the scale of the assessment must balance quality and quantity, taking into account available resources and time. Impact assessments can be recurring, so planning may extend over a longer period for deeper insights. Objective (factual) and subjective (perceptions/opinions) indicators are then identified to measure outcomes.

Next, data collection methods are chosen: quantitative (e.g., user statistics, questionnaires) for objective indicators, and qualitative (e.g., interviews, focus groups) for subjective ones. Mixed methods, such as combining statistical and open-ended questions, can also be effective. Secondary research may supplement primary data, but ethical considerations, including data privacy and GDPR compliance, must guide the process.

Finally, data analysis and interpretation are conducted using tools like SPSS (quantitative) or Atlas (qualitative). Best practices, such as validating interpretations with participants or internally, ensure accuracy before finalising the report.

Phase three - Impact narration

Phase Three focuses on communicating the impact assessment results to diverse audiences through tailored storytelling and visuals. The narrative should be adapted to the audience and include engaging elements like a setting, characters, plot, twists, and reflections. Visual tools like infographics, timelines, and maps can enhance clarity and appeal, with support from communication experts. Once the narrative is crafted, a structured dissemination plan ensures the findings reach the intended communities, while indicators help track the content's broader impact and engagement. The dissemination canvas tool can be found in Annex A.2.

Phase four - Evaluation

The final evaluation phase of the Europeana Impact Playbook focuses on reflecting on the impact assessment process to identify organisational needs, methodological strengths, and outreach effectiveness. The evaluation can target the entire assessment, specific phases, or individual steps. The Playbook suggests three approaches: a team debrief (inspired by Scrum Sprint, discussing successes, challenges, and improvements), a survey for colleague feedback, or Team-Based Inquiry (TBI), a structured four-step method (Question, Investigate, Analyse, Improve) designed for heritage education but adaptable to other contexts. After gathering insights, the findings are implemented to drive organisational improvements, ensuring continuous enhancement in future impact assessment cycles.

3 Methodology

3.1 Orientation

The pilot is divided into four dimensions (experiences, games, retail, and makers) and their use cases, representing several of Craeft's RCIs. In the experiences, we find activities related to silversmithing, wood carving, glass blowing, and pottery. For retail, we have used craft products from glass, silver, and textiles. Games and makers articulate broader aspects of crafts, and especially craft making, by offering practical information and suggestions that address not only sociocultural issues but also environmentally sustainable practices. Some of the dimensions and subsequent activities have a background in internal (project) and external work. This is mentioned in the related sections. The participants, stakeholders, and technologies of each dimension's activities vary and are presented in detail in the following sections, referring to each activity.

The general methodology followed for the pilot's activities is two-fold. Some activities were co-created with the project partners, using Europeana's Impact Playbook, while others were the result of the consortium's or involved partners' brainstorming. This differentiation exists because of the pilot's gradual launch, the partners' availability, and the dimension's needs. The pilot started in the second year of the project and will conclude at the end of 2026.

3.2 Data Collection

In this section, the data collection methods and data analysis procedure are presented. The methods are divided into the methods used to collect content for the activities of each dimension, and their evaluation. Ethical considerations are also included. Data analysis provides an overview of the general analysis procedure that took place for the pilot's activities, as well as the pilot in general. Detailed information about the evaluation plan and specificities of the methods used is included in the respective sections of each activity.

Primary research, that is, the collection of original data, took place for several of the pilot's activities. More precisely, this included the production of visual and textual material, observation, and interviews. Photographic material was produced in the context of the Retail dimension to document and disseminate images of craft products. For the Experiences dimension, 360° spherical images were produced for the use cases of wood carving in Yecla, Spain, and of the Margarites village with the tradition in ceramics in Crete, Greece. Last, the photographic documentation of the Games use case about the papier mâché sculpting workshop took place. It should be noted that primary visual materials are used in the pilot mainly for documentation and dissemination purposes rather than in-depth visual research [14]. Textual material was gathered in the form of a content collection form that was developed for the use case of Retail. The content was collected in collaboration with project partners and participants. Observation [15] took place during the Games use case of the papier mâché sculpting workshop to see how the children engaged with the papier mâché as a material and sculpting as a process. Expert interviews [16] were conducted as preliminary work for the development of the Experience dimension use cases and in relation to Craeft's RCIs on porcelain and tapestry, and a co-creation workshop took place to exchange knowledge and brainstorm with experts for the Games use case of the chess project.

Secondary research provided data already collected from the project's previous activities or other sources. For the Experiences dimension, visual material (videos and photographs) from the partners' archives was used for the application 'Shine Bright Like Silver' and the videos on glass technology. Furthermore, the egocentric videos captured during the WP1 activities provided further content for the 360 tour 'Yecla is Wood: An Artisanal Heritage', while one created with a silversmith as part of the Design pilot activities was also used in the Retail use case of the silver products. Textual materials were also used from the partners' archive for the Games' use case of the papier mâché sculpting workshop. WP1 research also contributed content related to the operational sequences, professional biographies, objects, materials, and workshops. Material from the silversmithing operational sequences and professional biographies was used for the Experience use case of the 'Shine Bright Like Silver' application. The identification and cataloguing of objects, materials, and workshops were the main content for the 'Crafts' board game use case and related content for the Margarites 360 tour experience. The VR experience on the glass gathering used material from the simulation that Khora developed for P1 Education & Training. Last, online sources were used to populate the Experience use case of the cultural tourism promotion platform and the 360 tour of the Margarites village.

For the primary content, consent forms were used for the expert interviews, the activities of the papier mâché sculpting workshop use case, and the content collection for the Retail dimension. For the papier mâché sculpting workshop, which was conducted in a school setting, the headmistress distributed a specialised consent form to the children's parents because she found Craeft's official consent form intimidating for the parents. Her judgment was based on the fact that many parents in Komotini's community are Roma or Muslim, and may not understand the formal, legal language. Furthermore, since kindergarten represents the children's first experience with formal education, the parents themselves are still becoming acquainted with the educational system's procedures. To uphold ethical standards, the headmistress created a simplified consent form that highlighted the essential details and shared it with the parents. Additional information about the project was provided verbally. Fortunately, all parents agreed and signed the form. The secondary content used for the pilot's use cases is part of the project partners' archive and under their intellectual property rights, except for the open-access material provided online. Project activities conducted in the framework of other tasks and work packages follow the ethical parameters specified and reported there.

3.3 Evaluation

For the evaluation of the pilot's activities, several methods were used. A classic quantitative survey (Patten 2014) was prepared for the Retail dimension, translated into the languages of the involved partners, i.e. English, French, and Greek. Furthermore, the technical performance logs [35] of the products' webpages were measured to count the number of visitors and the place of access. Mixed-methods surveys [17] were tailored for the needs of the Experiences dimension and the use cases of silversmithing and wood carving, and for the Games dimension and the use cases of the papier mâché sculpting workshop and the 'Crafts' board game. All the surveys were anonymous.

Interviews [11], also in the format of informal feedback, took place in the Experiences dimension and the use cases related to the videos on glass technology and the VR glass gathering experience. The informal feedback was anonymous, whereas the interviews took place with colleagues of the responsible partner, working under the same organisation. Case studies were developed in the Experiences dimension for the use case of the Cultural Tourism Promotion DIY Platform, the Games dimension for the 'Crafts' board

game and the chess project, as well as in the Makers dimension, to test their implementation in practical settings and reflect on their accessibility and ease. All participants were anonymous.

3.4. Analysis

The collected qualitative data can be separated into two forms: visual and textual. Visual data were provided through the Game dimension's use cases of the papier mâché sculpting workshop and the chess project. Textual data were gathered through the mixed-methods surveys and observation of the related activities. All qualitative data were coded and inventoried in Microsoft Excel. The quantitative data gathered through the surveys were also analysed using Microsoft Excel, which was used to better visualise the pilot's results. Parallel mixed analysis [17] helped join the results of each dataset and was followed by more focused analysis based on initial hypotheses of each activity (where applicable).

For the overall pilot analysis, first, we identified the impact pathway of each dimension and the specific values to which each use case contributes (Table 1). Then we analysed the results of each dimension by conducting a text analysis of the use cases' results per value. For the overall project results, we continued the analysis by bringing together the results of each dimension, grouping them into impact types, and reflecting on the overall results. Last, we recognise the problems and limitations that we faced during this process, and provide future recommendations.

Table 1. Pilot impact pathway

Dimension	Impact type	Value Lens	Use case
D1 Experiences	SP1 Socio-cultural	VL4 Learning	Mobile app 'Shine Bright Like Silver'
			360 Tour 'Yecla is Wood: An Artisanal Heritage'
			Videos on glass technology
			VR glass-gathering experience
		VL5 Community	Videos on glass technology
			VR glass-gathering experience
		VL3 Legacy	Mobile app 'Shine Bright Like Silver'
			360 Tour 'Yecla is Wood: An Artisanal Heritage'
			Videos on glass technology
			VR glass-gathering experience
		VL1 Utility	Cultural Tourism Promotion DIY Platform
	SP2 Economic	VL1 Utility	Mobile app 'Shine Bright Like Silver'
			Cultural Tourism Promotion DIY Platform
D2 Games	SP1 Socio-cultural	VL4 Learning	Papier mâché sculpting workshop

			The Chess Project
			‘Crafts’ Board Game
		VL3 Legacy	The Chess Project
		VL1 Utility	Papier mâché sculpting workshop
			The Chess Project
D3 Retail	SP2 Economic	VL2 Existence	
		VL4 Learning	
	SP4 Operational	VL1 Utility	
	SP5 Environmental		
D4 Makers	SP2 Economic	VL1 Utility	
	SP5 Environmental		

4 Experiences - Use Cases

4.1 Orientation - Study of existing cultural experiences

For practical reasons and to get an idea of what kind of cultural experiences exist in the context of crafts, Craeft partners conducted expert interviews related to the RCIs of porcelain and tapestry. For the porcelain, CNAM decided to conduct an expert interview with Delphine de Boisséron, former head of the Adrien Dubouché Museum's public and communication department. Today, she is the director of studies and research at the ENSAD Limoges and is a direct partner of CNAM for Craeft. The focus of the interview was the museum's mobile application, on which the expert worked while she was employed at the museum. The interview was conducted in two parts (onsite and online) in November and December 2024 with the written consent form of the participant.

For the tapestry in Aubusson, CNAM decided to conduct an expert interview with Jean-Philippe Trapp, Economic Development Project Manager at the Cité Internationale de la Tapisserie. He has crafted a cultural tourism initiative in Aubusson, called *Textile Tour*, which offers professionals in the textile and design industries a unique opportunity to engage with the region's rich heritage, contemporary practices, and collaborative ecosystem. The focus of the interview was the tour, its origins, and a discussion about the possibility of adding digital parameters. The results of this interview are considered an example of a cultural tourism practice related to a Craeft RCI. The interview was conducted in person in December 2024 with the written consent form of the participant.

4.1.1 Mobile application 'MNAD Limoges'

The National School of Decorative Arts (currently ENSAD Limoges) and the Musée National Adrien Dubouché share an intertwined history rooted in their common mission to preserve and promote the decorative arts. Founded under the leadership of Adrien Dubouché, the two institutions were initially housed together at Place du Champ-de-Foire, reflecting their complementary roles in education and cultural preservation. Even after the school's relocation in the 1990s, the museum preserved this shared legacy by repurposing the former classrooms to exhibit its exceptional 19th-century ceramic collection.

Both institutions played vital roles in promoting technical expertise and artistic innovation. The school trained artisans while the museum highlighted the history and craftsmanship of ceramics, offering resources and inspiration for both students and professionals. Through their collaboration, the school enriched the museum's collections, and the museum supported the school's pedagogical mission. This connection remains integral to the museum's identity as a centre of memory and innovation.

The links between the school and the museum continue to develop today, for example, through projects such as Atavism, an annual pedagogical project created in collaboration between the school's ceramics teachers and the museum team. The project consists of a contemporary reinterpretation by the school's students, who each work on a single object from the museum's collections.

The Adrien Dubouché National Museum introduced its mobile application, MNAD Limoges, in 2021, during the European Heritage Days. This application was designed and set by the museum's public service

and communication department to enable an accessible and interactive exploration of the museum for a diverse audience.

The development of the application was linked to the museum's tour route, particularly the section known as the 'Mezzanine of Techniques', which serves as both the starting and concluding point of the visitor's path. This section, introduced after the museum's renovation and reopening in 2012, focuses on the manufacturing processes of ceramics from historical, technical, and socio-cultural perspectives. Central to the application's concept is the restitution of gestures involved in ceramic craftsmanship, reflecting a commitment to preserving and showcasing the intangible cultural heritage of these artisanal techniques within the museum's narrative.

As a step-by-step guide to the museum's collections, the app is a valuable educational resource offering a comprehensive overview of the history of ceramics, making it easy to plan a visit, but also to consult its contents afterwards. Through a curated selection of 190 objects with their carefully written texts, the application offers an appealing introduction to the museum's collections and the wider universe of ceramic art.

The application's user-friendly interface is organised into various thematic sections, offering different ways of visiting and accessing the museum's objects, including the possibility of exploring a selection of objects in detail through 3D digitisation. The *MNAD Limoges* mobile app further enhances and enriches the visitor experience with audio and text content, and extensive archival and drawing-based photographic resources, making available to the visitor a wide variety of content, including video material, to enable a deeper exploration of the collections. The application is available for download on both iOS and Android platforms. Supported languages are French and English.

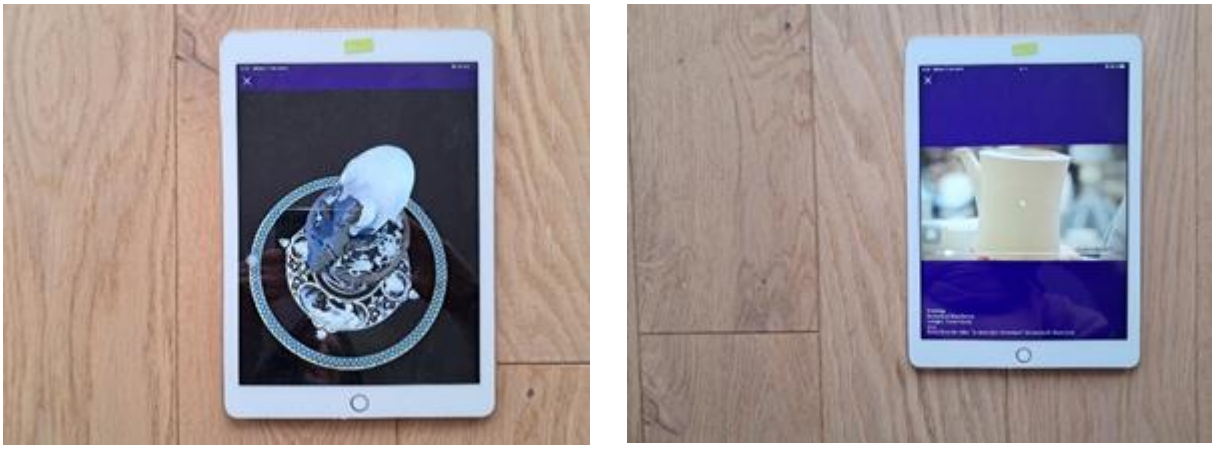


Figure 5. 3D Digitised objects from the museum's collections (left) and video excerpt on finishing techniques (right), Bernardaud Manufactory. © Inés Moreno

4.1.2 Cultural Tourism Experience, 'Textile Tour'

The *Textile Tour* originated as a response to the need for greater collaboration between the Cité Internationale de la Tapisserie and LAINAMAC. The Cité Internationale de la Tapisserie is a cultural and artistic institution in Aubusson, France, dedicated to the preservation, promotion, and innovation of the art of tapestry. It serves as a hub for showcasing the rich history and craftsmanship of Aubusson tapestry.

LAINAMAC is a French organisation based in Felletin, dedicated to supporting and promoting the wool and textile industry in France. It plays a central role in preserving traditional craftsmanship while fostering innovation, sustainability, and economic development in the textile sector. Both institutions shared complementary goals but operated in silos. Trapp envisioned the *Textile Tour* as a structured format to showcase the region's unique resources, inspire professionals, and encourage the settlement of new talent in the area.

The project started after the Cité Internationale de la Tapisserie hosted the Bettencourt Schueller Foundation laureates in Aubusson in 2021. They organised three to four-day programs which included a tour of the Cité, a meeting with a cartoonist, a night-time visit to the cartoon museum, and a tour of the spinning mills and workshops. The laureates were amazed because they had the chance to not only visit a museum but also meet makers and other important figures from the community, and understand how their work interrelated. In addition, Trapp observed through his work at the Cité that when they host professionals, they also enjoy meeting local people and visiting workshops in their free time. Eventually, Trapp and his colleagues developed an infrastructure and organised the first Textile Tour in 2022.

The *Textile Tour* offers a 24-hour immersive experience targeted at professionals with a genuine connection to textiles. Participants are introduced to local expertise through visits to spinning mills, dyeing workshops (natural and synthetic), and tapestry manufacturers. Furthermore, they gain cultural insights by participating in guided tours of the Cité's museum and the unveiling of works like the Aubusson Squares. Last, community engagement is enhanced through networking events with artisans, dyers, and weavers to foster collaboration and inspire projects. The *Textile Tour* operated so far only in 2022, when the participants surpassed the organisers' expectations with a total of 17 attendees out of many more requests. The cost is 150€, covering accommodations, meals, and activities. For 2025, there are two tours organised in May and October.

Jean-Philippe Trapp acknowledged the potential for integrating digital elements to complement the in-person experience. He finds that virtual reality, inspired by the Lascaux model, a portable VR headset, could showcase the weaving process, dyeing techniques, and the scale of monumental tapestries. Moreover, a virtual 'mini-tour' could attract professionals unable to visit Aubusson immediately, sparking interest in a future physical visit. In museums or workshops, AR could provide layered information about specific techniques or artworks, enhancing understanding without replacing the physical experience. Developing a dedicated website or mobile app for the *Textile Tour* could streamline communication, registrations, and follow-ups while offering access to digital content like video tours and interviews with artisans.

4.2 Mobile Cultural Application Use Case

The application *Shine Bright like Silver* for PIOP's Silversmithing Museum in Ioannina, Greece, and distance learning focuses on the techniques of sand casting and filigree, while at the same time prompts the users to visit further related places of interest in the city, such as the Ioannina Traditional Crafts Centre (KE.PA.V.I.). It includes texts, images, interactive learning material (connected through Craeft's e-learning platform), and a crafting simulation for sand casting. It targets craft enthusiasts who want to learn more about silversmithing techniques and visit other related places. The application also works as supplementary to the traditional museum exhibition through the more detailed interactive learning materials that it encompasses. This feature contributes to the informal learning of users at any time and from any place, rendering knowledge widely accessible.

To support replication and independent review of the use case, the following resources are provided: a short video walkthrough demonstrating the key interaction flow and functionality of the *Shine Bright Like Silver* application, and an archived release package for downloading and installing the application.

Video demonstration: https://youtu.be/vR_QPm1V1fs

Download application (archived release): Zourarakis, D., & Kaplanidi, D. (2026). *Shine Bright Like Silver*. Zenodo. https://doi.org/10.5281/zenodo.18771799

4.2.1 Requirements

To initiate brainstorming and have a guideline from the creation to the evaluation of the introductory crafting experiences, we conducted a workshop using Europeana's Impact Playbook. First, we brainstormed about who could be the relevant stakeholders interested in an introductory crafting experience. To select a group, we prioritised them by placing them in a matrix with two axes: one indicating how important the stakeholder is, and the other how directly or indirectly they are affected by our activities. Although museum and art curators are important for adding value to a craftsperson and artist's work, they are indirectly affected by the museum's activities. We believe that educators and the general audience are neutral in matters of importance and the level to which they are affected by our activities. The most relevant crowd seemed to be makers (artists using crafts in their practice or craft enthusiasts). We chose them as our main stakeholders, but soon realised we had to divide the group into professional and casual makers because of the differences we think they place in making and crafting (i.e. a source of making a living or a hobby). Therefore, our target stakeholders are the craft enthusiasts.

To better understand the stakeholders, we filled out the Empathy Map. We concluded that a craft enthusiast does not see many rich experiences with advanced digital technologies related to crafts in museums. They hear about PIOP's museums' existence and visit them because of their enthusiasm for craft and industrial heritage. We acknowledge that, as a group, their activities depend on their knowledge level, but they show an interest in enriching that. They are open to new experiences and can serve as a suitable audience for offering valuable feedback and further suggestions.

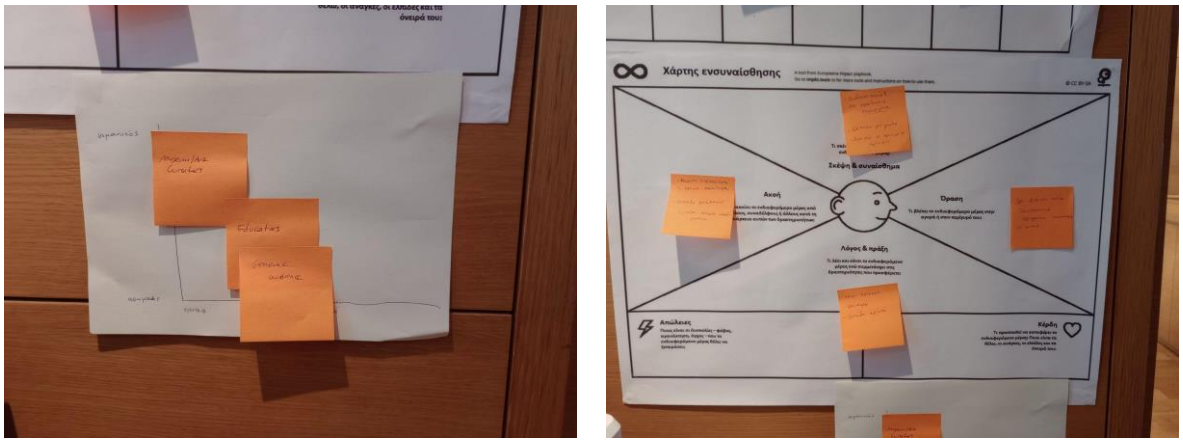


Figure 6. PIOP's Stakeholder Prioritisation and Empathy Map. Photos: Danae Kaplanidi / PIOP.

After getting a hold of our stakeholders, we advised the Value Lenses to define the desired outcomes (short- and long-term) of the developed activity. We agreed that, independently of their knowledge level, we wish to make them even more interested in the craft, that is, to 'nudge' their curiosity to further look into and think about the craft after their visit and experience in the museum. Moreover, we want to offer more information than that of the present-day exhibition. In the long term, the stakeholders might feel more connected not only to the local craft community but also to the European (or even international) community. Also, by offering more enriching cultural experiences, we contribute to informal knowledge transmission and the safeguarding of the craft. We acknowledge, though, that we can be accountable only for the short-term outcomes that are directly connected to living the experience.

Figure 7. PIOP's Change Pathway. Photo: Danae Kaplanidi / PIOP.

The introductory crafting experience links to the project's activities focused on understanding and transmitting knowledge about specific craft gestures at various levels. Having completed the WP1 tasks, we used the research material to design an introductory crafting experience that will focus on the techniques of the RCIs involved in Craeft, which are marble carving and silversmithing. Therefore, we explored developing a targeted museum experience connecting traditional techniques with contemporary, everyday objects to make the stakeholders feel the timelessness of craft techniques. The preliminary scenario included a focused museum tour on techniques, the use of interactive videos available on Craeft's e-learning platform, and a VR experience of crafting an everyday object. The idea assumed that the interested visitor could make a reservation to live the experience before their museum

visit. After further practical considerations, this would not be feasible because there are not many museum professionals to support a physical experience at the museum, either as a guide or to provide digital devices.

4.2.2 Design

The design process of the application 'Shine Bright Like Silver' began with the creation of wireframes using Figma. These wireframes served as the initial, low-fidelity blueprint of the application and defined its structure before visual design and implementation took place. Following the use case scenario (Annex C.1) provided by PIOP – Museum of Silversmithing, the wireframes outlined the application's overall layout, user flow, and screen-to-screen transitions.

At this stage, the emphasis was placed on functionality rather than aesthetics. Each wireframe included the placement of core UI elements (buttons, icons, text areas), the order of user interactions, and the logic for navigation. This allowed the team to validate clarity, accessibility, and the pedagogical structure of the experience before producing the final visual design.

After each full set of wireframes was completed, it was shared with the PIOP team for review. The feedback process ensured that the user experience aligned with the museum's educational goals and that the interface remained intuitive for visitors of all ages.

The wireframes design of the application is presented in detail in Annex I.

4.2.3 Implementation

FORTH prepared a first draft of the mobile application to see how the user will navigate during a museum visit, but also from a distance. The application 'Shine Bright Like Silver' was developed using the Unity Engine as the main platform, targeting Android devices such as Smartphones and Tablets. Unity is a cross-platform engine used for creating interactive 2D, 3D, VR and AR applications. It combines a visual editor with the C# programming language, allowing developers to design, prototype and deploy projects across multiple devices.

In the first version of the Application, the available features included: A) Multilanguage support (Greek and English), B) Interactive content, directly related to the Museum of Silversmithing in Ioannina and its exhibits, C) Offline Functionality, allowing all multimedia content to be accessible without the need for internet connectivity. More specifically, the application provided five main sections which the users can find inside. The section 'Techniques Museum Tour' will guide the users through three exhibition stations related to Sand Casting, Filigree Techniques and the Ioannina Traditional Crafts Centre. The section of 'Interactive Learning Material' offers simple and short interactive games that allow users to test their knowledge of the silversmithing techniques. The section 'Make an Object' will allow users to virtually create a crafted object. The 'Evaluation' section, where users can complete a short survey regarding their experience with the Application and finally the Settings Section, where users can adjust basic preferences. Each station is combined with descriptive texts and audio-visual material to provide users with an engaging and educational experience.

For the design and development of the UI (User Interface), we used Figma, which is a collaborative, web-based platform that allows creating wireframes, mock-ups and interactive prototypes. The UI layouts were first designed in Figma and then imported back to Unity for integration with the rest of the application logic. Within Unity, the interface was implemented using the built-in UI System (Canvas, Panels, Buttons), which allowed us to structure the navigation flow of the application. At this stage, the programming logic was developed to handle user interactions and navigation, ensuring smooth transitions between the home screen and each section of the application. Once the navigation system was completed, the next development phase was on the interactive learning content and the minigames hosted inside the application. Although the original concept involved using H5P material, Unity does not directly support H5P Files. Therefore, the interactive games (How it's made, Memory Card Game) had to be designed and programmed from scratch within Unity and then integrated into the corresponding sections of the application. In addition, audio assets were produced using the TTSMP3 (Text to Speech) software, allowing the generation of instructions that enrich the user experience. These audio files were then imported and synchronised with the application's interactive elements. PIOP reviewed the texts, visual material, and overall design and aesthetics. In parallel to the software development, PIOP prepared the interactive learning material to be included in the application. Lumi, an online free-access tool to create educational material, was used to produce interactive videos and learning games based on audio-visual content related to the museum exhibition.

After the completion of the first version, additional adjustments were made based on internal testing and content review. This second development phase introduced new features which enhanced the educational and interactive experience of the application. In this version, new interactive material was integrated, including an interactive quiz video featuring Yiannis Mentis, a master silversmith, demonstrating the Filigree Technique. Users can watch the video and then answer related questions to test their understanding of the process, receiving a score at the end of the activity. Furthermore, additional games were developed and added, increasing the available activities per technique from two to approximately four. New instructional content was also introduced for the Traditional Crafts Centre of Ioannina, together with location information accessible through Google Maps integration.

Additionally, a side menu was implemented, enabling users to directly navigate between the main sections of the application, thereby bypassing the linear navigation flow if desired. Finally, the 'Evaluate' section was redesigned, enabling users - after exploring all available content - to provide feedback through a simple form with separate fields for comments about (A) the Museum and (B) their overall experience with the application. When the second draft was ready, a more in-depth review focused on the application's content (text, sound, visuals), the user experience (navigation and buttons), and the aesthetics (colours, text font and size).

The application supports both Greek and English, but for clarity, the mock-ups presented in the following figures display the English version. These screens illustrate the final implemented interface in Unity and correspond to the sections and functionalities described above.

Figure 8. Intro Screen - Intro Animations

The first two screens displayed upon launching the Android application present the institutional and development credits. The intro sequence begins with the Piraeus Cultural Foundation, followed by a second screen showing the Foundation for Research and Technology - Hellas (FORTH), which has developed the application. Both screens use a blurred background image from the museum of Silversmithing in Ioannina and are shown as a short animation of approximately six seconds.

Figure 9. Application Loading Screen

After the introductory animation, the application transitions to a loading screen that prepares Unity subsystems before the Main Menu appears. This screen displays the application Title, the museum's logo, and a loading indicator. It remains visible for approximately 4 seconds, during which the core scripting managers are activated, and the initial assets are loaded. The background image is again sourced from the Silversmithing Museum of Ioannina, maintaining visual consistency with the previous screens.

Figure 10. Main Menu - Overview of the Five Core Sections

The application's main menu is structured as a horizontal carousel that gives access to the five core sections defined in the use case scenario: Techniques, Interactive Learning Material, Create an Object (Simulation), Evaluate Us, and Settings. Each screen maintains a consistent visual identity, featuring the museum background, the application logo, language selection, and an exit button. Users can navigate through the sections using the left and right arrows, while the central circular button of each page serves as the main entry point for the corresponding feature.

Figure 11. Main Menu - Utility Functions - Exit Confirmation & Language Selection

Two additional utility screens complement the main menu functionality. The Exit Confirmation screen allows the user to close the application by choosing *Yes* or return to the main menu by selecting *No*. The Language Selection screen enables switching between English (EU) and Greek (GR), using flag icons to clearly indicate the chosen language. Both screens maintain the same visual identity and background imagery used across the application, ensuring consistency in the user experience.

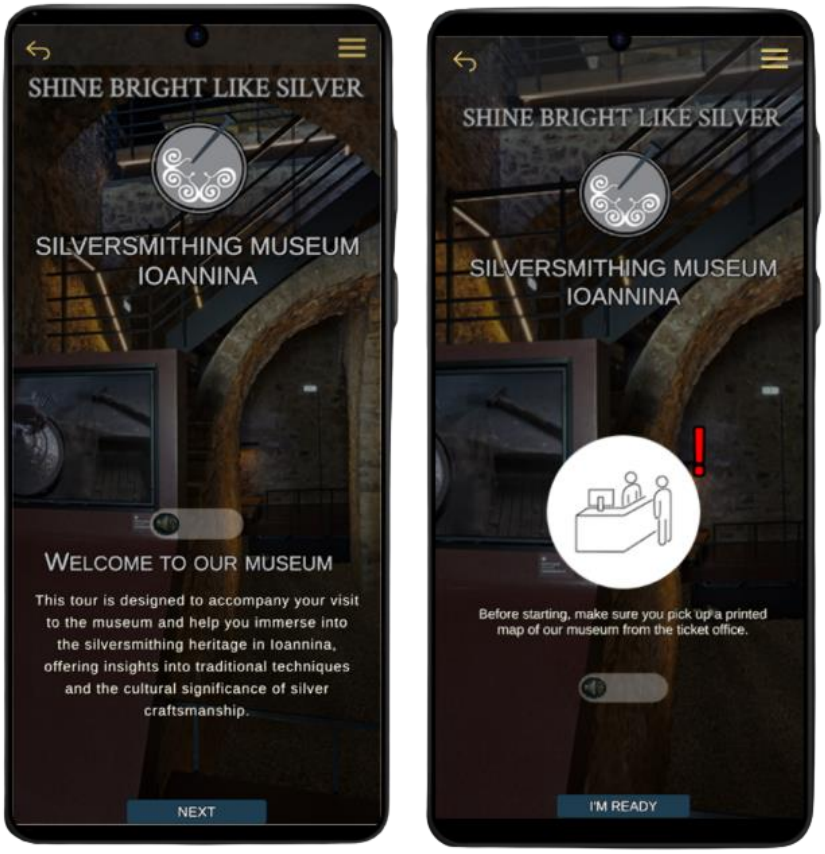


Figure 12. Techniques Museum Tour - introductory Screens

These two screens introduce the user to the Techniques Museum Tour. The first screen welcomes visitors to the Silversmithing Museum of Ioannina and provides an overview of the tour's purpose. The second screen informs users to collect a printed map from the museum's ticket office before beginning the tour, ensuring orientation within the physical exhibition space. Both screens share the same background image from inside the museum, and include the application logo, the museum title, and navigation elements such as the Back arrow (returning to the five main sections) and the Side Menu icon located at the upper-right and upper-left corners. An additional audio playback button allows users to listen to AI-generated narration of the on-screen text, supporting accessibility and enhancing the visitor experience. The call-to-action buttons (Next and I'm Ready) guide the user to the subsequent steps of the tour.

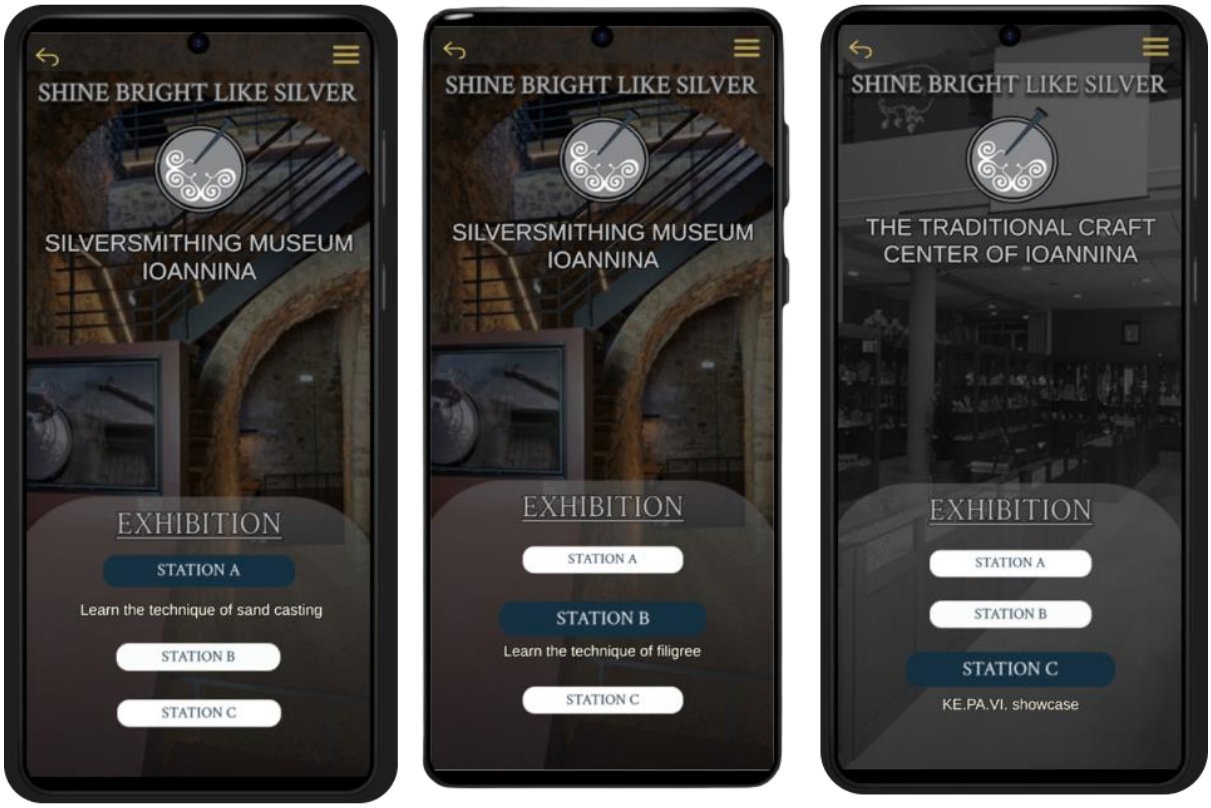


Figure 13. Techniques Museum Tour - Station Selection Screens

These three screens present the user with the available exhibition stations of the *Techniques Museum Tour*. The tour includes:

- Station A: Sand Casting – focusing on the traditional sand-casting technique and its associated learning material.
- Station B: Filigree – introducing the detailed wirework technique used in traditional silversmithing.
- Station C: The Traditional Craft Centre of Ioannina.

Each station is displayed with the corresponding background image from the museum or the KE.PA.VI. Exhibition area. Users select a station by tapping on the respective button, which leads them into the dedicated learning flow for that technique. The screens maintain consistent design elements, including the museum logo, application title, back-navigation arrow, side menu access, and instructional text below each station label.

Figure 14. Side Menu - Quick Navigation Panel

The side menu provides users with direct access to four of the five main sections of the application: *Techniques*, *Interactive Material*, *Simulation*, and *Evaluation*. This navigation panel allows users to bypass the linear progression of the main menu and jump directly to any section they wish to explore. The currently active section is highlighted in yellow for clarity. The panel also includes quick-access actions such as exiting the application and switching the interface language by selecting the corresponding flag icons. The *Settings* section is intentionally omitted from this menu, as it contains only credits and general application information. The design follows the same visual theme as the rest of the interface, maintaining background continuity with the museum interior.

Figure 15. Station A - Sand Casting Introduction and Interactive Games

These two screens form the core user flow for Station A: Sand Casting, guiding visitors through both the physical exhibition and the digital activities offered within the application.

The first screen provides an introduction to the sand-casting technique, accompanied by a representative icon and on-screen instructions. Users are prompted to visit the corresponding exhibition area inside the museum to read the display text, watch the technique video, and examine the tools showcased on site. An audio playback button is available to hear the AI-generated narration of the instructions. When ready, users continue by pressing the *Next* button.

The second screen presents the three available interactive learning games related to Sand Casting:

- Step by Step: Arrange the process steps of sand casting in the correct order.
- Memory Game: Match pairs of cards featuring tools and procedural elements.
- How It's Made**:** Place each tool or technique element in the appropriate box.

A *Back to Stations* button allows users to return to the station selection menu, marking Station A as completed and enabling them to proceed to Stations B or C.

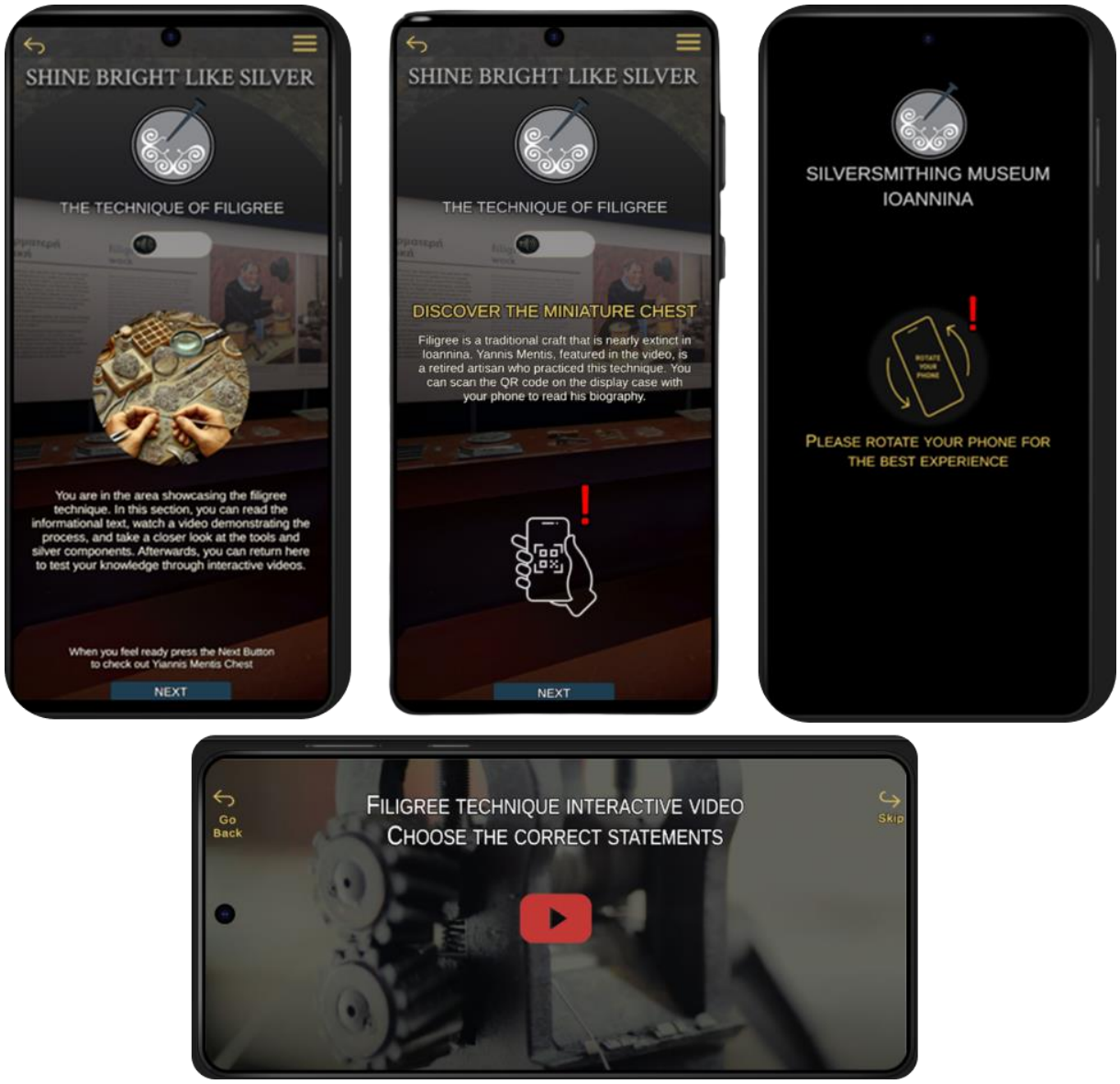


Figure 16. Station B - Filigree Technique Flow (Introduction, QR Guidance, Orientation, Interactive Video)

These four screens guide the user through the complete experience of Station B: Filigree, combining physical exhibition instructions with digital interactive content.

The first screen introduces the filigree technique and instructs visitors to explore the corresponding exhibition area inside the museum. Users are encouraged to read the informational text, observe the tools and silver components, and watch the physical demonstration video. After completing the on-site exploration, they may return to the app to proceed with the interactive activity.

The second screen highlights a key exhibit, the *Miniature Chest*, providing contextual information about the traditional filigree craft, which is nearly extinct in Ioannina. The screen features a visual prompt directing users to scan the QR code found on the physical display case to access the biography of the artisan *Yannis Mentis*, who appears in the demonstration video.

The third screen is a short, animated orientation message instructing users to rotate their device horizontally for the optimal viewing experience, as the next screen contains interactive video content presented in landscape mode.

The fourth screen displays the interactive filigree video, where users can watch the demonstration and then answer embedded questions by choosing the correct statements. A *Play* button initiates the video, while *Skip* and *Go Back* navigation buttons allow users to control their progression within the station.

Across all screens, consistent visual elements, such as the application logo, back-navigation arrow, side menu icon, and museum-themed backgrounds.

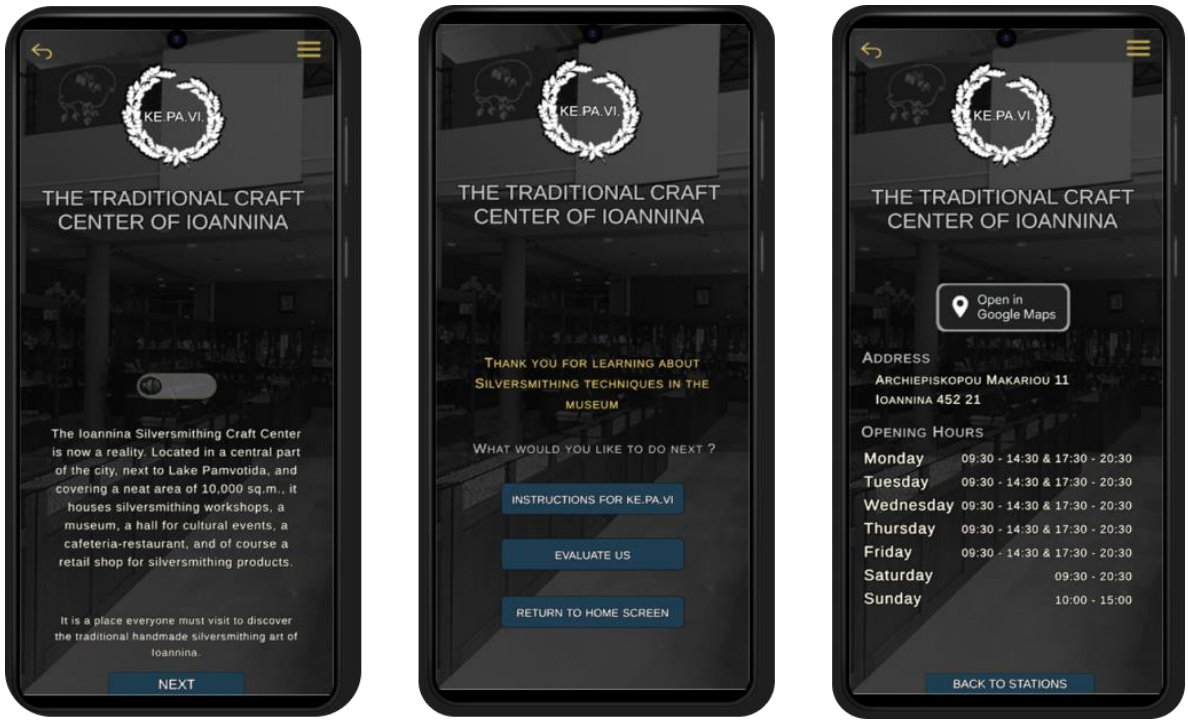


Figure 17. Station C - Traditional Craft Centre of Ioannina Flow

These three screens guide the user through Station C, which introduces the Traditional Craft Centre of Ioannina (KE.PA.VI.), a key location connected to contemporary silversmithing activities in the region.

The first screen presents an overview of the Craft Centre, including a short description of its function as a multi-purpose cultural and commercial hub that hosts workshops, exhibitions, events, and a retail shop for handmade silversmithing products. An audio narration button allows users to listen to the introductory text. A *Next* button directs users forward.

The second screen is displayed once users have completed all three museum stations, providing a closing message: *'Thank you for learning about Silversmithing techniques in the museum.'* This page offers three navigation choices:

- Instructions for KE.PA.VI,
- Evaluate Us,

- Return to Home Screen.
  This ensures that users can either continue to the Craft Centre information, give feedback, or exit to the application's main menu.

The third screen provides practical visitor information for KE.PA.VI., including the full address, opening hours for each day of the week, and a button that opens the location directly in Google Maps. A *Back to Stations* button allows the user to return to the museum tour interface.

Figure 18. Settings Screen

The *Settings* page provides users with essential institutional information and access to external resources. It includes four interactive banners:

- Silversmithing Museum of Ioannina – opens the museum's official website.
- Piraeus Cultural Foundation – links to the foundation's webpage.
- Institute of Computer Science – FORTH – credits the design and development team and redirects to the institute's website.
- Terms & Conditions – provides access to the application's usage policy.

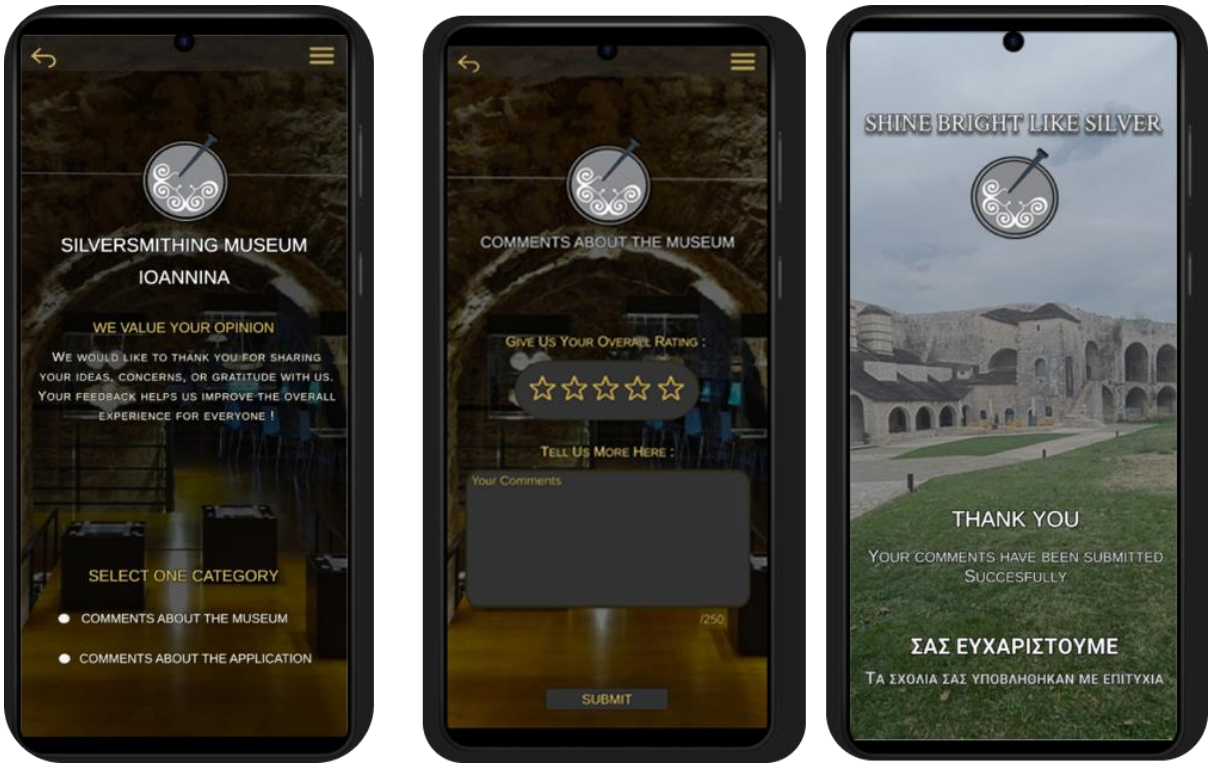


Figure 19. Evaluate Us Section - User Feedback Flow (Category Selection, Rating & Comments, Submission Confirmation)

These three screens present the complete *Evaluation* flow, allowing users to provide feedback either about the Silversmithing Museum or about their experience with the application.

The first screen invites users to select one of two evaluation categories:

- Comments about the Museum
- Comments about the Application

It includes the standard navigation elements (Back arrow and Side Menu) and an introductory message emphasising the importance of visitor feedback.

The second screen is displayed once a category is selected. It provides a five-star rating system and a text input box (up to 250 characters) where users can share more detailed comments. A *Submit* button finalises the feedback process. The layout is designed to be simple and readable, ensuring that users of all ages can provide input quickly and comfortably.

The third screen confirms that the submission has been successfully received. A short 'Thank you' animation appears for approximately five seconds, acknowledging user participation before automatically navigating back to the application flow. The message is displayed in both English and Greek to ensure clarity for all visitors.

Figure 20. Interactive Learning Material – Technique Selection Screen

This screen introduces the Interactive Learning Material section, where users can choose between two traditional silversmithing techniques (Sand Casting & Filigree) to access the corresponding educational mini-games. Each technique is represented by a circular icon that functions as a button leading directly to the interactive activities designed for that technique. The layout maintains consistent navigation controls, including the Back arrow and the Side Menu icon, ensuring seamless movement across the application. Background imagery from the Silversmithing Museum creates visual continuity with the rest of the user interface.

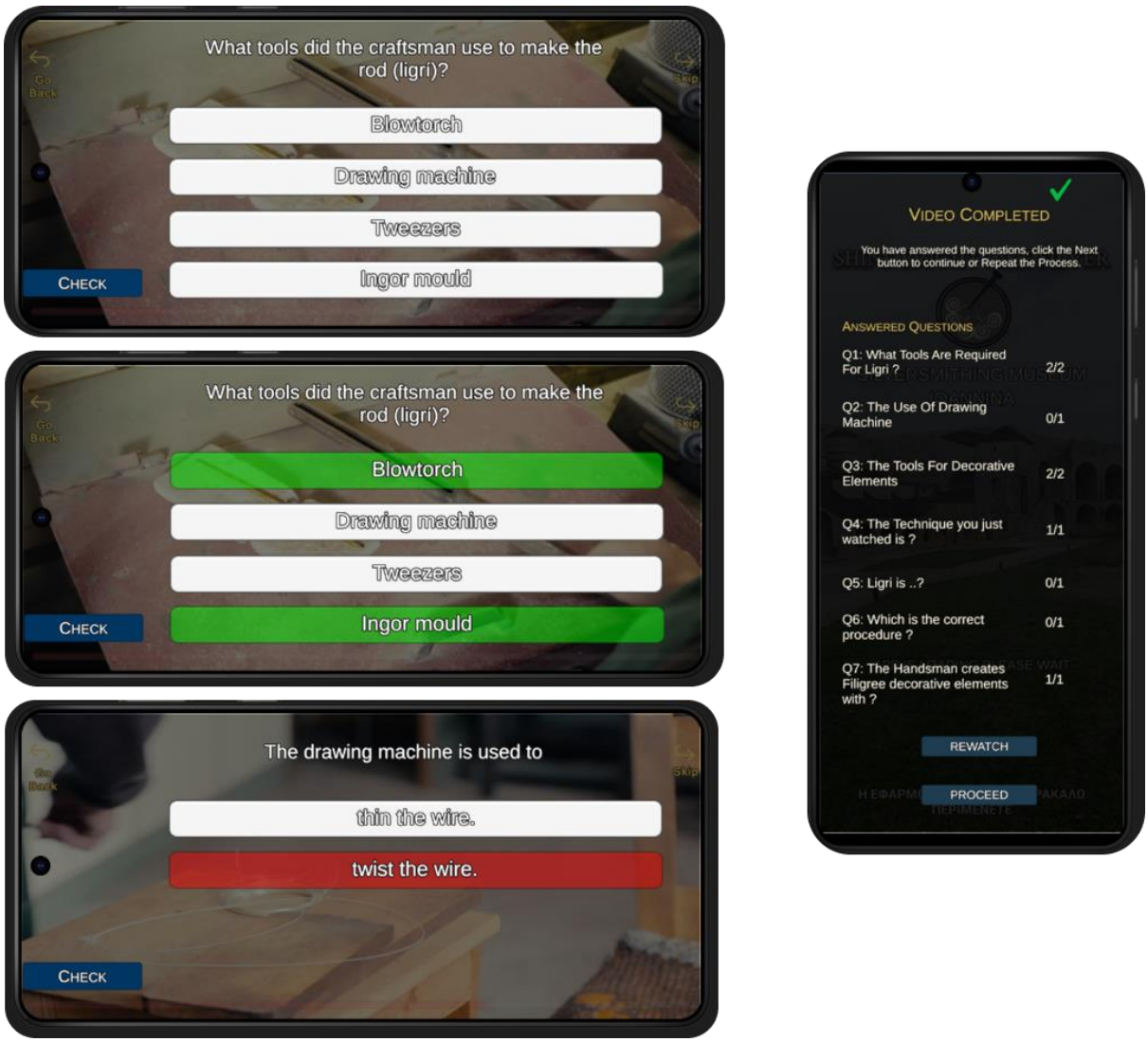


Figure 21. Interactive Video – Design & Functionality

The application includes an interactive quiz video for the Filigree Technique, designed to combine audiovisual learning with knowledge assessment. The user must rotate the device horizontally to enter the interactive video mode.

The interactive sequence is structured into four screens:

1. Question Screen: The video pauses periodically and displays questions related to the technique, with multiple-choice answers. The user selects the options and presses Check to validate the answer.
2. Answer Feedback: Selected answers are highlighted in green if correct and red if incorrect, allowing users to immediately understand their mistakes and learn from them.
3. Progress through Questions: Different questions appear throughout the video, with 2–4 available answers each. The 'Go Back' and 'Skip' buttons remain available for user control.

4. Results Summary: At the end of the activity, a summary page displays all questions (7 total) along with the user's score. Two options are provided:
    - Rewatch the video
    - Proceed to the mini-games of the Filigree technique

This interactive video enhances user engagement and supports learning through active participation.

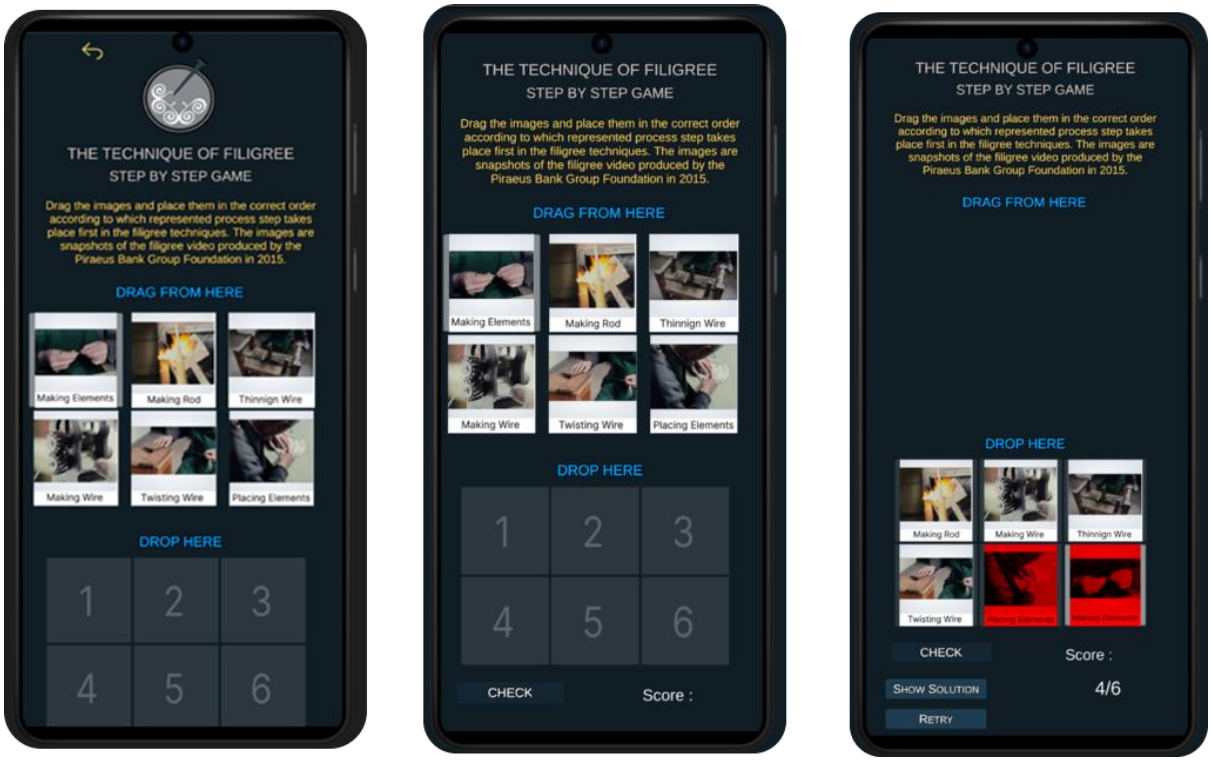


Figure 22. Games Section – Interactive Material (Step-by-Step Game – Filigree Technique)

This mini-game is part of the Interactive Learning Material section and focuses on helping users understand the correct sequence of actions in the Filigree technique. The activity consists of three screens:

- Screen A. Instructions & Image Set: The screen displays the game's title ('Step by Step Game') along with instructions. Users must drag the images representing different stages of the filigree process and place them in the correct order into the numbered slots below. The images are still frames captured from the official video of the technique.
- Screen B. Interaction & Placement: Users can scroll vertically to view all available images. Once an image is dragged into a slot, the slot number updates visually. When all slots are filled, a CHECK button appears at the bottom of the screen, allowing users to submit their attempt. A dynamic Score indicator displays the number of correct placements (e.g., 'Score: 0/6').
- Screen C. Results & Feedback: After pressing CHECK, the game provides immediate visual feedback:
    - Correctly placed images remain in their normal appearance.
    - Incorrectly placed images are highlighted in red, helping the user identify mistakes.

Users can select Retry to attempt the game again or Show Solution to see the correct sequence. A Go Back arrow at the top left allows the user to return to the Techniques mini-games menu at any time.

Figure 23. Games Completion Status

This screen displays all the interactive games available for the Filigree technique. Each game is presented with its corresponding icon and a short description of the activity (Step by Step, Right Tool Right Process, Memory Game, and How It's Made). The page also includes a progress indicator system:

- Green checkmarks appear next to the games the user has already completed.
- Games without a checkmark remain pending, guiding the user on what is left to explore.

A Back to Stations button at the bottom allows users to return to the three main museum stations at any time, while the top navigation bar provides access to the side menu and a return arrow.

4.2.4 Evaluation

To evaluate the mobile application, we prepared a mixed-methods survey to address the desired outcomes of PIOP's change pathway. Those were to make craft enthusiasts more interested in the craft, transmit more knowledge on the techniques, make them feel more connected not only to the local craft community but also beyond, and transmit the knowledge to safeguard it. Those are both short and long-term outcomes, which we acknowledge are hard to precisely measure and be accountable for through Craeft's activities. The wider impact areas they address are learning [88], legacy [90], and the experience economy [89].

The survey includes two parts. Part A contains the standardised survey and analysis tool of the User Experience Questionnaire (UEQ) [91]. We completed it with two open-ended questions at the end, asking *'What did you like most?'* and *'What did you like less'* to capture more comments. We have previously used this approach in the Horizon 2020 project Mingei. Part B includes six single-choice questions targeting the desired outcomes mentioned above. These questions use a scale of 5, from 'not at all' to 'very much'. Two last questions seek to measure the overall stakeholder satisfaction through a scale of 10, from 'extremely dissatisfied' to 'extremely satisfied', and the likelihood to recommend the application to a friend or family member, from 'not at all likely' to 'extremely likely'. Demographic data are also collected at the end to have an overview of the country of origin and the age of participants. Available languages included Greek and English. The English survey can be found in Annex B.1.

To test the application with users, we visited the Silversmithing Museum in Ioannina, where we worked with regular museum visitors. The evaluation of the application took place on Thursday, 10 and Friday, 11 July 2025. An informative sheet with an installation guide was available at the ticket area. Nevertheless, to avoid internet-related obstructions, the application was also loaded on six tablets. A PIOP colleague and the museum professional working at the Tickets area informed incoming visitors about Craeft's application and asked them to test it during their visit as an accompanying tool targeting specific thematic areas of the museum. As the museum route is linear (separate entrance and exit), another PIOP colleague and the museum professional working at the Shop gathered the tablets and asked the visitors to fill out the evaluation survey. Due to the limited timeframe of the evaluation and the choice to work with regular museum visitors, a sampling frame [11] was not prepared. Instead, we asked every visitor for their participation and respected their wishes.

To analyse the evaluation data, Microsoft Excel was used for quantitative data and text analysis for the qualitative data. The results are presented in four sections referring to the sample of the research participants, the results of the UEQ questionnaire, the quantitative results of the survey questions, as well as qualitative results from the survey's open-ended questions. The quantitative results are accompanied by graphs.

Overall, 26 visitors participated in the evaluation of the application. 48% were from Greece, while 12% were from Germany and the UK, respectively. Other countries included Cyprus, Denmark, Israel, Switzerland, and the USA. The participants' age ranged mostly between 25 and 34 years old (43%). 22% were under 18 years old, and 13% between 45 and 54 years old. The figures below show the sample's demographic information in detail.

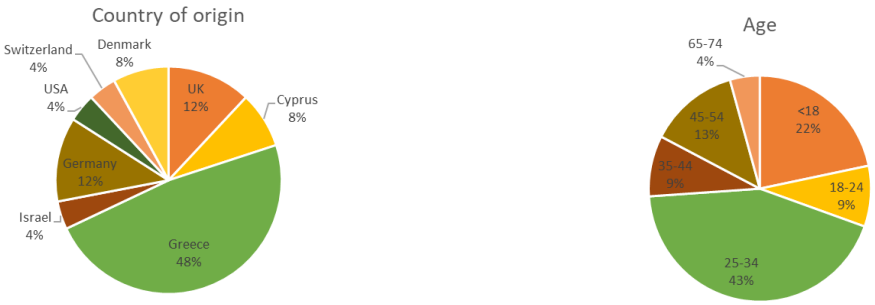


Figure 24. Left. Participants' country of origin. Right: Participants' age.

Quantitative results

Analysis of the UEQ with Excel showed that the application had an excellent score regarding its attractiveness and good scores regarding stimulation and novelty. Perspicuity and efficiency are above average, while dependability scored negatively. It should be mentioned that the negative score cannot be interpreted because two participants failed to answer a couple of the questionnaire's questions corresponding to this feature. The figure below represents the benchmarking graph of the questionnaire's results.

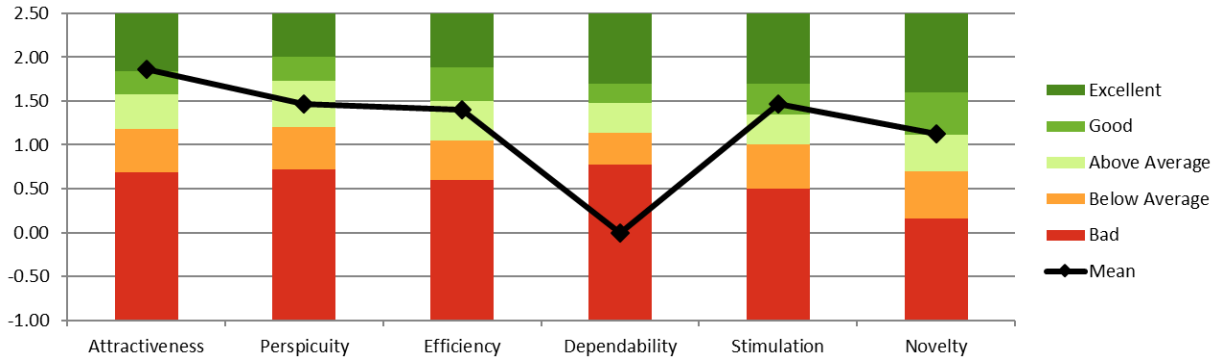


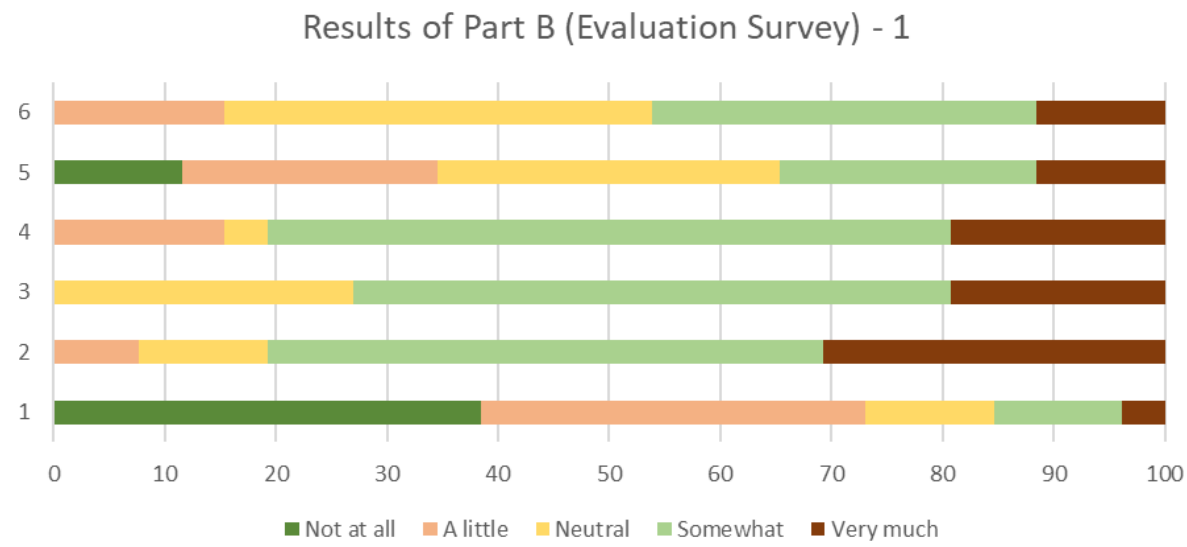
Figure 25. Benchmarking graph of UEQ results

The quantitative questions of the evaluation's Part B offer more insights about the user's perception regarding the application's learning outcomes, relation to the experience economy, and legacy features. More specifically, about 70% of the participants stated that they were not very knowledgeable about silversmithing before visiting the museum and/or using the application. This changes significantly after their visit, where 50% declare that they somewhat learned more about silversmithing, and 31% think they learned a lot. 73% (54% somewhat, 19% very much) note that the application made them want to learn even more in the future. One of the questions also measures the intent to visit other places related to silversmithing as a result of learning and wanting to learn more about this craft. 61% responded that they somewhat would, 19% they definitely would, while 15% said a little.

Two questions focused on the experience economy and tried to calculate the level of craft-related consumers' habits while travelling and the intention to buy craft products as a result of using the application. Interestingly, 31% answered neutral regarding their consumption habits while travelling, while 23% equally responded a little and somewhat, respectively, and 11% not at all and very much, again

respectively. The intention to buy craft products after using the application and visiting the museum seems slightly better. 38% replied again neutral, but 34% said that they somewhat buy craft products as a result of their experience. 15% noted a little, while 11% answered very high intention.

Concerning the legacy of the application, which means the intention of the participants to recommend it to friends and family members, 78% responded that they would. Furthermore, almost 80% declared themselves generally very satisfied with their experience using the application during the museum visit. The figure below shows the results of Part B's quantitative questions in detail.



1	How knowledgeable were you about silversmithing before visiting the museum and/or using the application?
2	How much do you think this application helped you learn more about silversmithing?
3	How much do you think this application made you want to learn more?
4	Would you visit other places related to silversmithing as a result of your experience visiting the museum and using the application?
5	How often do you buy craft products while travelling?
6	Would you buy craft products as a result of your experience visiting the museum and using the application?

Figure 26. Results of the evaluation survey's quantitative results.

Qualitative results

The qualitative questions, 'What did you like most?' and 'What did you like least', about the application offered more insights about what the participants enjoyed and gained through the application, but also what was considered problematic and could be improved. Text analysis showed that the responses

regarded several topics, including general comments, the museum exhibition, the application's content, user experience, learning outcomes, and specific comments about the interactive learning material. Overall, the positive comments (42) were more than the negative (12).

The participants enjoyed using the application during their museum visit. They found it interesting, understandable, and original. One mentioned that the combination of texts and videos in the application was balanced. Although one participant noted that there were many steps in each technique/station, another highlighted that there could be more. A couple of participants also suggested adding more content related to, for example, old documents of silversmiths from 100 or 200 years ago, or including diagrams representing the knowledge. Another participant noted that there could be more interaction with the exhibits through, for example, QR codes, graphics, and augmented reality features.

Regarding the application's user experience, two participants found it very easy to use. Nevertheless, a couple of problems were also noted. First, a malfunction of the interactive learning videos, and second, the fact that the stations in the museum exhibition were not very clear in the application. A participant also found the simultaneous use of the application during the museum visit to be disorienting because they could not keep up with texts, videos, and interactive learning material at the same time. They would prefer to have used the application separately towards the end of their museum visit.

Six participants also highlighted the application's learning outcomes. A couple of them noted that the application helped them memorise the information about techniques and tools, while another emphasised 'its auxiliary nature to understand and assimilate the exhibits'. Others underlined the interactive aspect of learning and answering, and appreciated the variety of learning pathways.

The interactive learning material, or else the games, as the participants called them, appeared to be a popular feature of the application that also attracted younger generations. It was considered an advantage that they included visual material from the museum exhibition. In that way, the users were able to easily track objects in physical and digital formats. The memory game and the interactive videos were especially popular. The memory game was considered a smart way to propagate knowledge, although one participant found it difficult to understand how it worked and what the user was expected to do. The interactive videos were appreciated for intensifying museum knowledge. The 'Place the process steps in the correct order' motivated the participants' attention to the exhibition and visual material. Two participants also expressed their curiosity about the simulation component, which, unfortunately, was not ready at the time of the evaluation.

In summary, the UEQ analysis revealed that the museum application excelled in attractiveness and scored well in stimulation and novelty, with perspicuity and efficiency rated above average. The evaluation’s Part B highlighted significant learning outcomes between the participants’ pre- and post-knowledge levels. Although the responses related to the experience economy were mixed, the app’s legacy was strong in matters of satisfaction and recommendation. Qualitative feedback further supports the app’s learning aspect with the interactive learning material (e.g., memory games, videos) as a standout feature, praised for enhancing engagement and knowledge retention. Criticisms included occasional technical malfunctions, unclear station guidance, and the challenge of multitasking between the app and the exhibit. Overall, positive feedback outweighed negative, reflecting a well-received, educational, and engaging user experience.

4.3 Heritage' Map

The main objective of the “Yecla is Wood” application is to strengthen the visibility and understanding of furniture, in general, and woodcarving, in particular, as a living craft and as a fundamental part of Yecla’s heritage. More precisely, it aims to:

- Offer a digital and immersive tool that connects key locations related to the woodcarving tradition of Yecla.
- Enhance knowledge transmission and public awareness through a virtual map combining 360º images, explanatory videos, and descriptive texts.
- Provide a didactic resource for visitors, students, and professionals that illustrates the furniture industry's evolution.
- Foster synergy between craft, technology, and education, aligning cultural preservation with CETEM’s research and training activities.
- Valorise current furniture and woodcarving businesses.

It includes different locations across the city, as well as a virtual historical museum which does not exist physically and is the first one to exist, contributing in this way to the safeguarding of the local craft tradition. It is available through a website (computer experience) and by using VR glasses (immersive experience) on the premises of CETEM.

More broadly, the application aims to support cultural tourism in the city of Yecla and beyond through the inclusion of craft-related locations and the creation of a new virtual historical museum. Educationally, the virtual museum accumulates related socio-historical and craft-related knowledge and presents it to a wide audience. The computer experience renders the information available to anyone at any place. The immersive experience at the premises of CETEM contributes not only to new content but also to a new feature in the organisation’s activities that will enhance the contact of the visitors with the craft. Overall, these aspects aim to valorise wood carving traditions and their future local and global development.

The *Heritage Map* is delivered as a web-based experience to enable immediate access without installation. The online page below provides the interactive map interface, allowing users to explore the curated content and navigate the experience as described in this section.

Online experience page: https://virtualmap.craeft.eu/

4.3.1 Requirements

A workshop using Europeana's Impact Playbook was conducted in Paris in October 2024 during the consortium’s plenary meeting. CETEM agreed that the general public would be the targeted stakeholders for the crafting experience. Annually, on average, more than 150 students from schools, high schools, and training centres visit CETEM, intending to learn about the work carried out at the technology centre. Furthermore, around 80 adults from senior centres visit the centre to learn about the different activities and projects carried out. Finally, it should be mentioned that from the numerous international initiatives and projects, approximately 150 people have visited their facilities. This group includes project partners attending consortium meetings, students, and attendees at the final presentations of projects.

From the training activity, on average, around 15 training courses are implemented at the centre for approximately 140 students (50% workers and 50% unemployed). All students also visited CETEM facilities during the different courses. In addition, due to the daily activity of CETEM, contact with companies and professionals in the sector is constant. Around 200 people visit the centre annually to be informed about different activities and participate in workshops, project meetings, and so on.

In total, CETEM can estimate that annually around 720 people, with varied profiles, visit the institution. Nevertheless, this data could have some fluctuations due to events. For instance, in 2024, CETEM organised TecniHabitat, a fair on technology for the woodworking sector with more than 200 participants in only two days. Furthermore, the CETEM website receives annually more than 15.000 visits.

Looking at the Value Lenses of the cultural activity, CETEM acknowledges that they wish to enhance the learning aspect of the existing tour and connect the experience with the local community. CETEM recognised that offering more information to the general public and connecting the cultural experience with the local community of wood carvers are short-term outcomes for which they can be accountable. Further developing the audience's curiosity is desired but seen as a long-term outcome that CETEM cannot guarantee through their activities. The figure below depicts the Value Lenses of the expected outcomes.

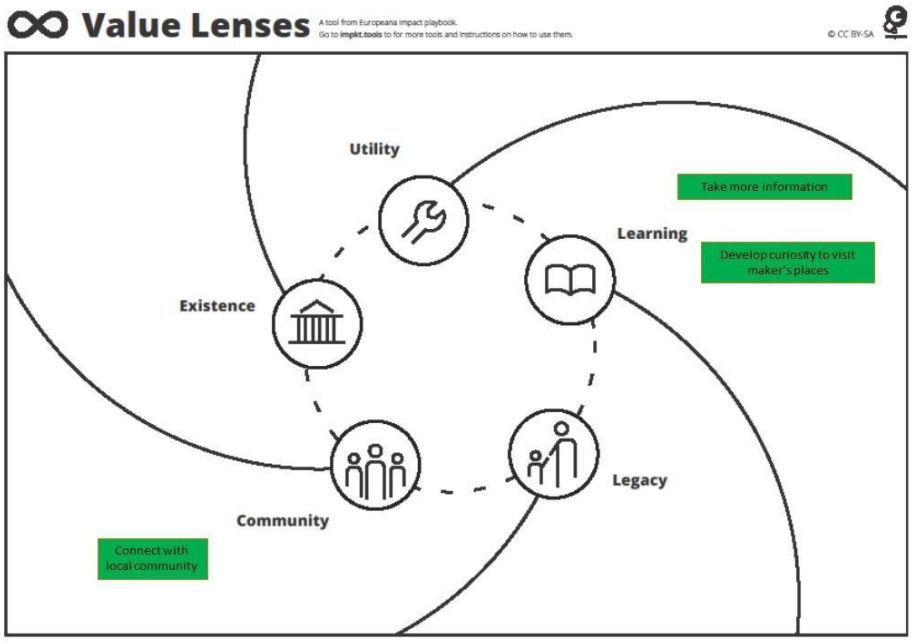


Figure 27. CETEM's Value Lenses

In this context, and also considering practical aspects of how these outcomes could be achieved, CETEM decided that the most suitable way for them to valorise the cultural craft experience for their general public is to create a virtual museum of their technological exhibition, which will be contextualised with local historical information about wood carving, furniture making, and cultural traditions related to the processions held during the Holy Week. Furthermore, they will associate the wooden objects with their makers, workshops, and shops by inserting the relevant information. This effort aims to promote a visit to those places. The virtual museum will be hosted on CETEM's official webpage. Below is the Change Pathway that we created.

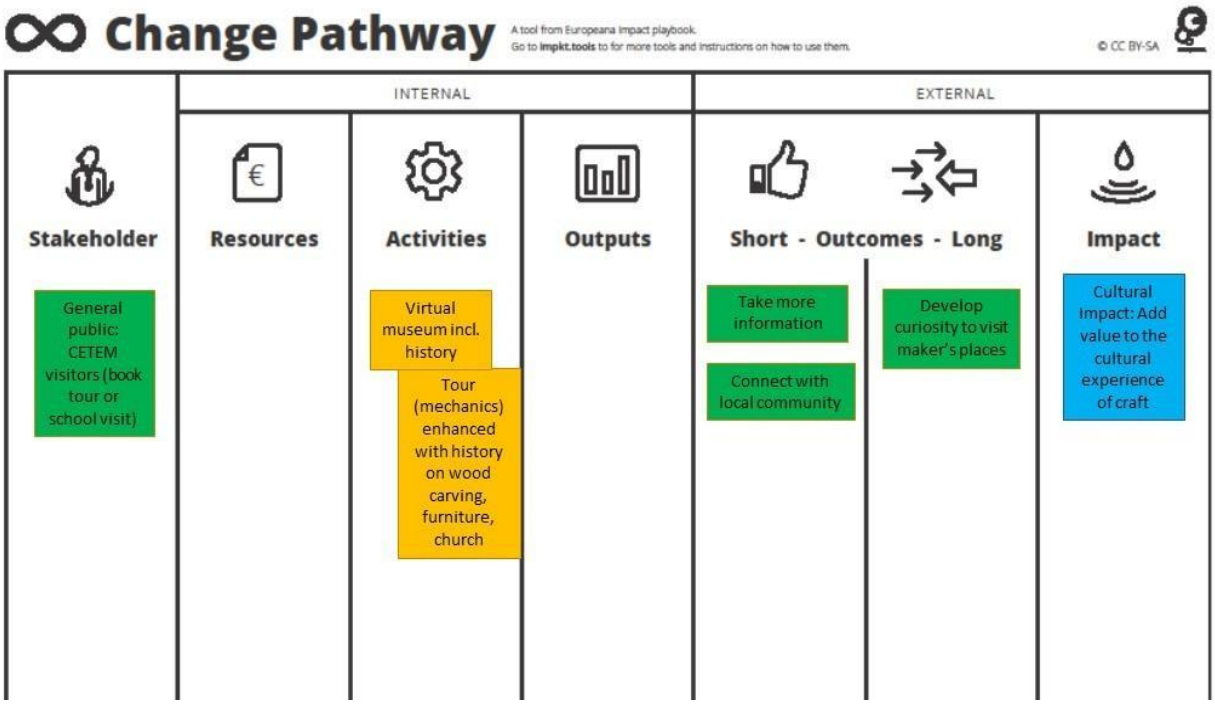


Figure 28. CETEM's Change Pathway

4.3.2 Implementation

After the workshop, a use case scenario was developed by CETEM (Annex C.2), where the virtual museum is going to be used as a new cultural tourism tool in different ways. First, as a link on CETEM's website and the Yecla Tourist Office, which will allow any interested visitor to discover more about the city and its craft tradition in relation to furniture and woodcarving. Second, as a new experience with the different visits that are received at CETEM, the Technology Centre of Furniture and Wood of the Region of Murcia. Each year, it welcomes an average of around 720 visitors from diverse backgrounds, including students from schools and training centres, senior groups, professionals, and international project partners. And third, as a leaflet with a QR code placed in the different locations of the virtual map, CETEM, and the Yecla Tourist Office. This will create synergies between the different locations and create interest and awareness among visitors in the furniture and woodcarving Yecla tradition.

The application was developed using Angular, A-Frame, and Three.js. Angular serves as the foundation for the application and the entire UI system, including the management of user interactions and events. A-Frame, a web framework for creating 3D and WebVR scenes, is used to construct the virtual environments using the captured 360° photos. Three.js manages the functionality of the 3D components within each scene. To proceed with the technological development, five main locations in Yecla were selected to represent the evolution of the woodworking craft and its connection with cultural and industrial identity. The users can access the map through the application's home screen, where they can click on any of the areas described before to start the navigation of the selected area. In addition to the map, the home screen includes buttons for changing the language between English and Spanish, muting the background music that plays during navigation, accessing a separate page for evaluating the application, and viewing information about the CRAEFT project.

Figure 29. The application's home screen.

For each area, 360° photos were collected, and each photo represents a navigation point within the area. For each area, a graph was created to define the possible connections between points. Each node contains the skybox image and the positions of other navigation points relative to the user's current location. Navigation between points is smooth and intuitive, and is achieved through virtual footprints on the floor, helping users orient themselves easily. Each navigation point offers a realistic representation of the corresponding physical location. Many of the 360° photos also contain points of interest, which are indicated by animated icons to make them easily noticeable. Clicking on these points opens panels with multimedia content (images, videos, text), providing additional information about the space.

Figure 30. Virtual footprints and a point of interest.

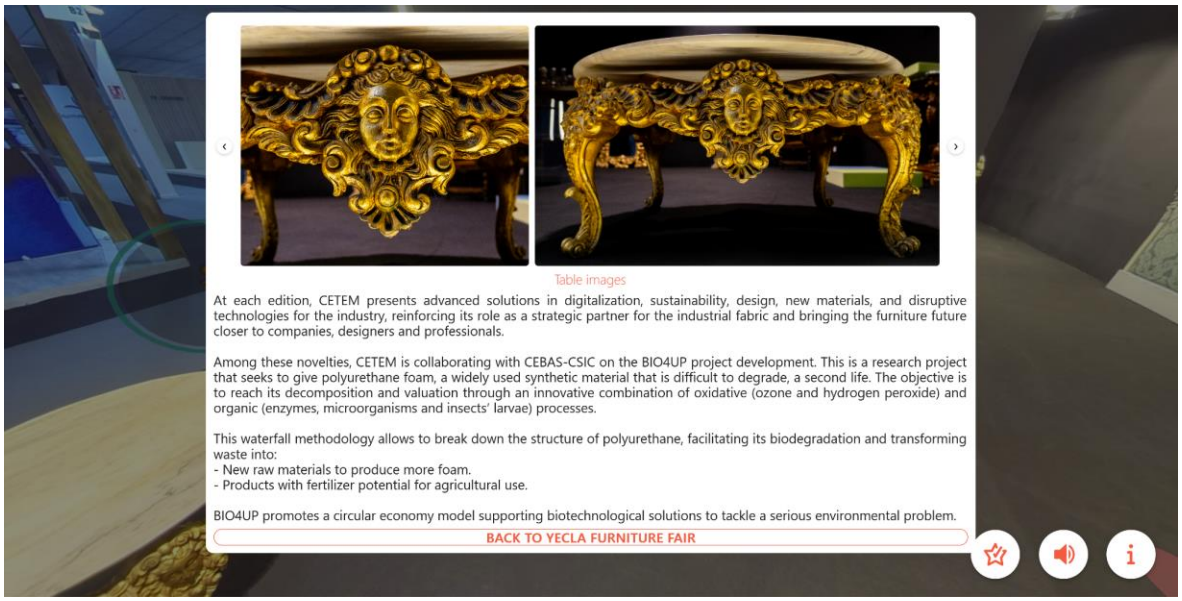


Figure 31. Information about a point of interest.

The points are outlined as follows.

Woodcarving workshop

A real artisan workshop showcasing carving tools, techniques, and the traditional working environment. The virtual visit integrates egocentric videos of woodcarving, originally recorded for the CRAEFT ethnographic protocol (WP1), together with additional video footage and interviews illustrating the craft in context. The visual experience is completed with four 360º panoramic images that guide visitors around the workbench, offering an immersive introduction to the tools, gestures, and methods characteristic of this discipline.

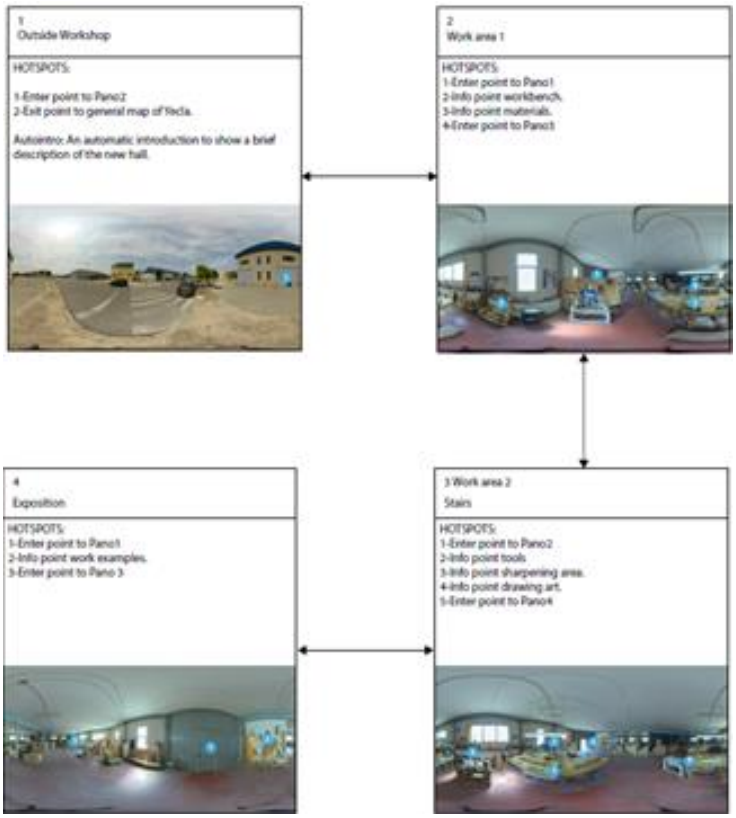


Figure 32.Graph describing the connection between navigation points for the woodcarving workshop.

Museum of Yecla's Patron Festivities

Focuses on religious woodcarving and the emblematic throne of the Virgen del Castillo, masterfully carved by the local artisan Pedro Ortega. The virtual visit features nine 360º panoramic images that allow visitors to explore the entire museum. In addition to a general introduction to the site and Yecla's traditional festivities, this location highlights the close relationship between woodcarving, art, and faith. It presents the historical and artistic significance of the throne, an entirely hand-carved masterpiece, the life and work of Pedro Ortega, and images of the arquebuses, wooden muzzle-loading weapons traditionally used during the celebrations.

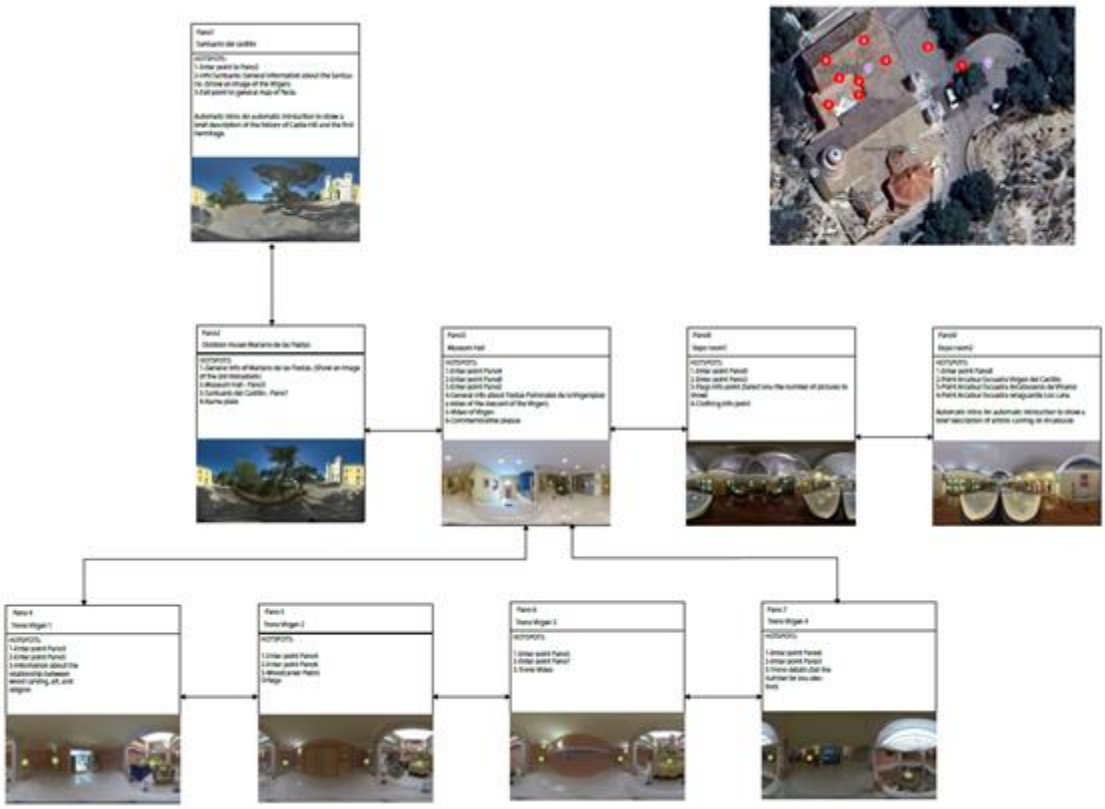


Figure 33. Graph describing the connection between navigation points for the Museum of Yecla's Patron Festivities.

Yecla Furniture Fair

Represents a meeting point where tradition, innovation, and design converge, projecting Yecla's deep-rooted craftsmanship and industrial identity to an international audience. The virtual experience includes ten 360º panoramic views that guide visitors through the fair's main areas and exhibitions. The visit begins with a summary video introducing the history and significance of the fair. The virtual tour also features an exhibition of woodcarving artworks, presenting pieces by renowned local artisans such as Pedro Ortega, Francisco Sánchez, and José Antonio Ibáñez. Visitors can navigate through a sequence of thematic rooms that include detailed 360º views, videos, and information hotspots on each piece, from decorative mirrors and headboards to Baroque-inspired sculptures and Rococo-style furniture.

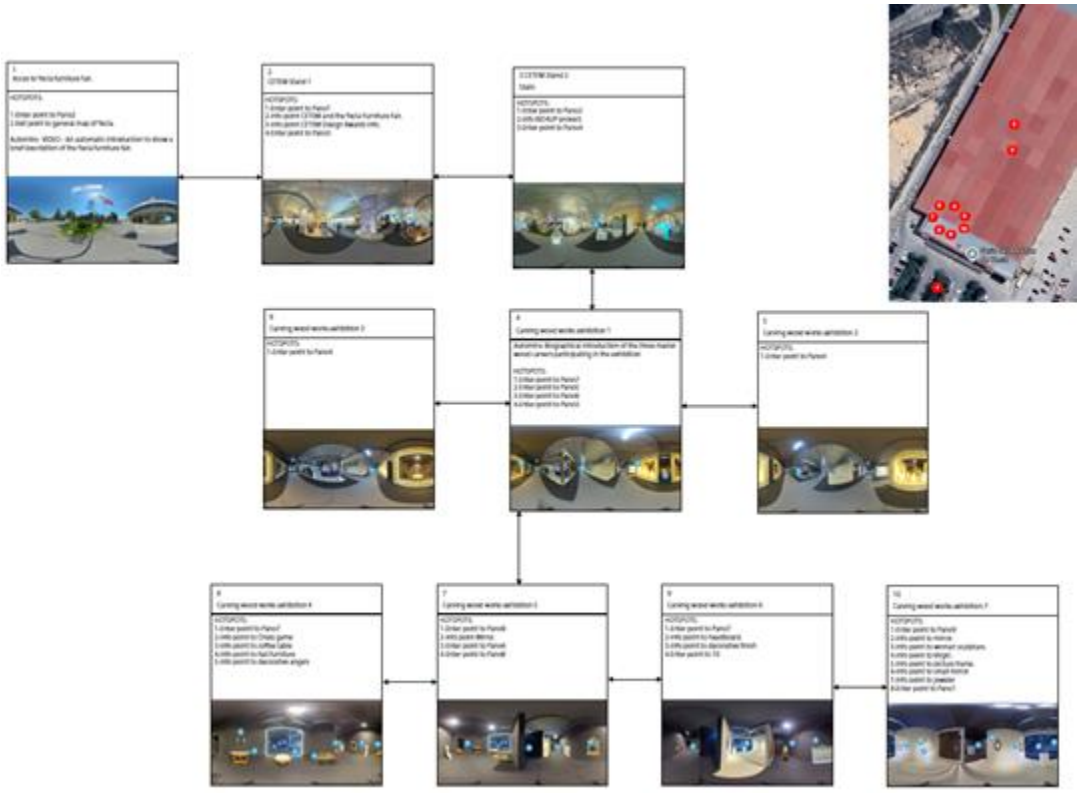


Figure 34. Graph describing the connection between navigation points for the Yecla Furniture Fair.

City Hall

It represents the historical and civic heart of Yecla, the birthplace of the modern city. The virtual visit begins outside, with 360º panoramic views of the square and the Renaissance-style Casa Consistorial. Through an immersive sequence of eight interconnected 360º panoramic views, visitors can explore both the historic and the contemporary dimensions of this landmark. Inside, the imperial marble staircase, carved coffered ceilings, and wooden furnishings highlight Yecla's deep connection with craftsmanship and artistry. The route includes a section titled 'Yecla: Tradition and Innovation,' which illustrates the city's transformation from an artisanal and agricultural settlement into a major industrial and design hub for furniture manufacturing.

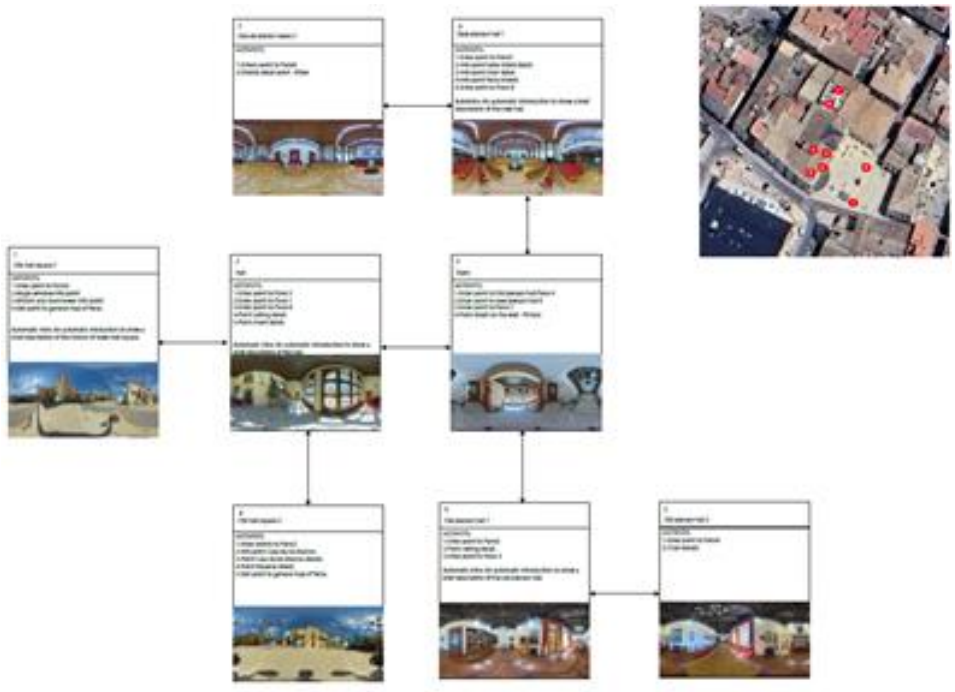


Figure 35. Graph describing the connection between navigation points for the City Hall.

CETEM

Technology Centre of Furniture and Wood of the Region of Murcia: Represents the connection between tradition, innovation, and technology in Yecla's furniture and wood sector. The virtual visit includes eleven 360º panoramic scenes that guide visitors through its facilities, offering an immersive insight into how craftsmanship evolves into industrial innovation. The route includes the training area, which highlights CETEM's educational initiatives, including the online course 'Introduction to Wood Carving', developed within the CRAEFT project for the Education & Training pilot. Moreover, a series of laboratory panoramas allows users to explore the different research areas that drive technological advancement in the sector: Robotics and Automation; Additive Manufacturing; Materials, Adhesives and Polymers; and Final Product Testing Lab. Throughout the visit, interactive videos and information points present an example of woodcarving technology innovation.

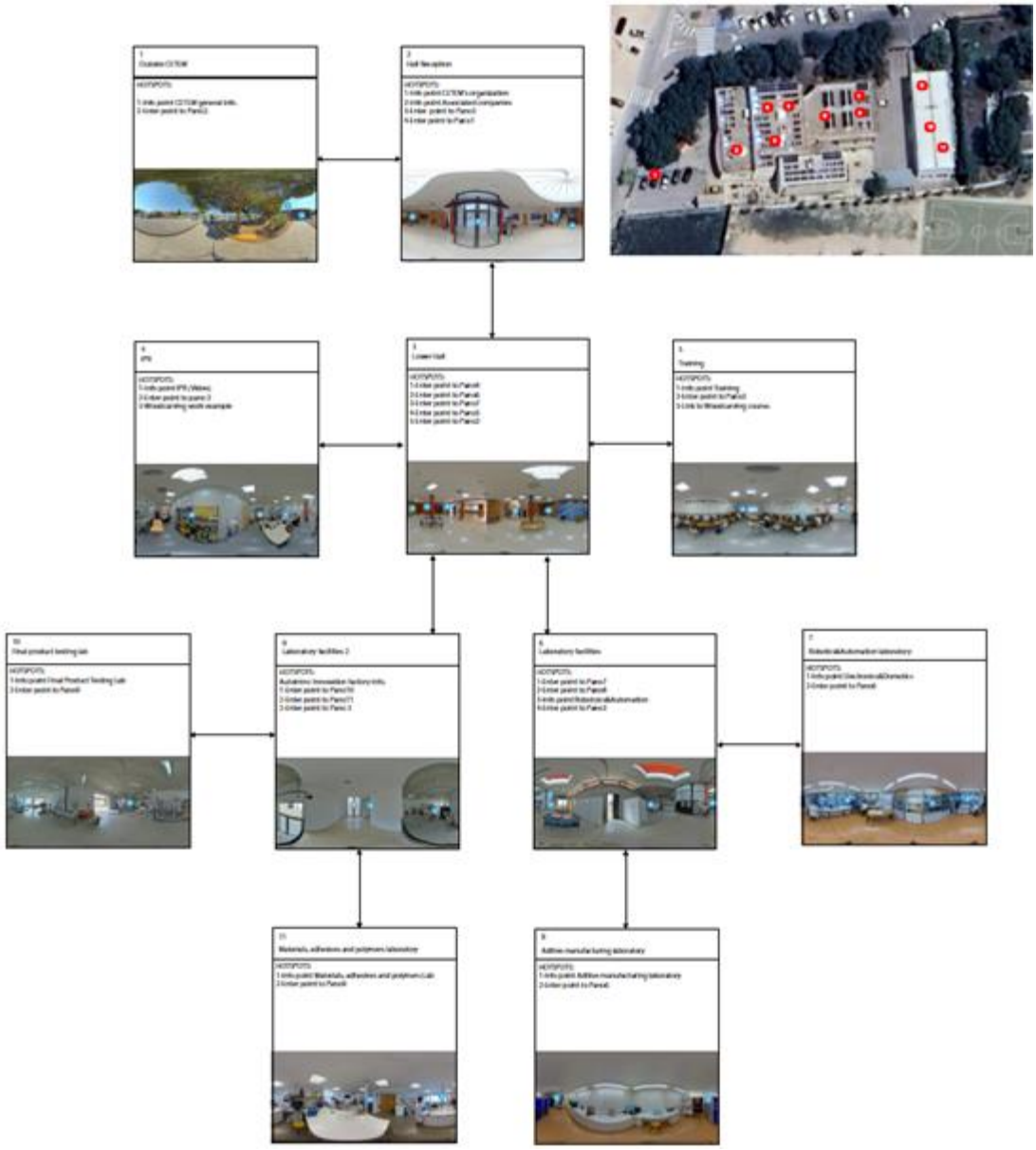


Figure 36. Graph describing the connection between navigation points for CETEM.

Valorisation Section

The virtual map also includes a specific section dedicated to the valorisation of Yecla's furniture and wood companies, showcasing the diversity and excellence of its productive ecosystem. A total of twelve companies is presented, grouped into five main categories that reflect the different specialisations of the local industry:

- Turning and carving: companies that preserve the artisanal essence of woodcarving and turning while adapting it to contemporary design.
- Wood transformation: firms specialising in advanced machining, CNC processes, and the transformation of wood-based materials.

- Furniture components: manufacturers producing structural and decorative wooden elements for the upholstery and furniture industries.
- Occasional furniture: companies focused on auxiliary and decorative furniture, blending craftsmanship with modern production.
- Home and contract furniture / Upholstered Furniture: leading brands representing Yecla's international presence through high-quality home and contract collections, integrating traditional know-how with innovation and sustainability.

This section highlights the industrial and artisanal complementarity that defines Yecla's identity, a region where craftsmanship and advanced manufacturing coexist, strengthening both local heritage and global competitiveness.

4.3.3 Evaluation

To evaluate the physical and online experiences developed by CETEM, two mixed-methods surveys were formulated according to the desired outcomes (see Annexes B.2.1 and B.2.2). One of the main outcomes focuses on the learning of CETEM visitors, either in their physical space or in their website, about wood carving and connecting that heritage with other places in the city of Yecla, including workshops and historical sites.

Evaluation method

The survey to evaluate the online experience is a shorter version of the one developed to evaluate the experience conducted at CETEM's premises with a group of stakeholders. The long survey comprises two parts. Part A contains the standardised survey and analysis tool of the UEQ, completed with two open-ended questions at the end, asking 'What did you like most?' and 'What did you like less' to capture more comments. Part B includes five single-choice questions targeting the desired outcomes, which are learning, intention to visit relevant workshops and places in Yecla and beyond. These questions use a scale of 5, from 'not at all' to 'very much'. A last question seeks to measure the overall stakeholder satisfaction through a scale of 10, from 'extremely dissatisfied' to 'extremely satisfied'. Demographic data are also collected to have an overview of the country of origin and the age of participants.

The shorter version includes three questions related to the learning experience, and two open-ended questions for positive and negative features that could help it improve in the future. Lastly, two ranking questions measure the general user satisfaction, as well as the intention to recommend it to friends and family. Demographic data are also included here. The survey was intentionally designed to be short to not tire the online participants. To maximise the accuracy of the answers, all questions use a scale from 1 to 10 to have a greater variety of responses and perceptions. The survey was developed in digital format in Google Forms and was accessible through the online experience.

Before the external evaluation, the virtual museum was internally tested by CETEM staff and students enrolled in training courses at the centre who had no prior involvement in the development of the virtual museum and were unfamiliar with the work carried out. This initial testing phase made it possible to detect usability issues, verify content clarity, and implement preliminary improvements to the navigation and overall user experience.

Following this internal validation, an evaluation session was conducted with a group of young visitors attending CETEM. Participants were given 20–30 minutes to freely explore the virtual museum and then complete the evaluation questionnaire. The questionnaire, included as an annex to this report, is mainly composed of Likert-scale questions assessing usability, content quality, and overall satisfaction, complemented by open-ended questions designed to capture qualitative feedback on the aspects they liked most and least (Annex B.7).

Notably, the group of participants included visitors from outside Yecla, whose responses provided particularly valuable insights into the platform's effectiveness as a tool for interpretation and dissemination for audiences without prior knowledge of the local furniture and woodcarving heritage.

Figure 37. Visitors of the Virtual Museum

Evaluation results

In total, the virtual museum was tested by 25 participants, including 15 CETEM staff members and students and 10 visitors to the centre. Among them, seven participants came from outside Yecla, providing feedback from users without prior familiarity with the local furniture and woodcarving context. The group shows a balanced gender distribution, with 14 females (56%) and 11 males (44%), and is composed mainly of young people. As such, the sample can be considered representative of a generation that has largely grown up outside the traditional woodcarving culture of Yecla, making it especially suitable for assessing the museum's capacity for knowledge transmission and engagement (Figure 38).

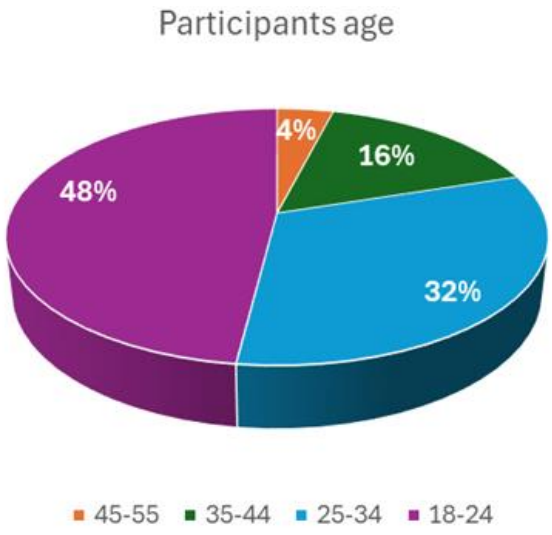


Figure 38. Age distribution of participants involved in the evaluation activity

The first part of the questionnaire consisted of pairs of contrasting characteristics describing potential perceptions of the virtual museum. Participants were asked to indicate their level of agreement by selecting a position on a 7-point semantic differential scale (Figure 39). For each pair of attributes, an average score was calculated to provide an overall view of participants' perceptions (Table 2).

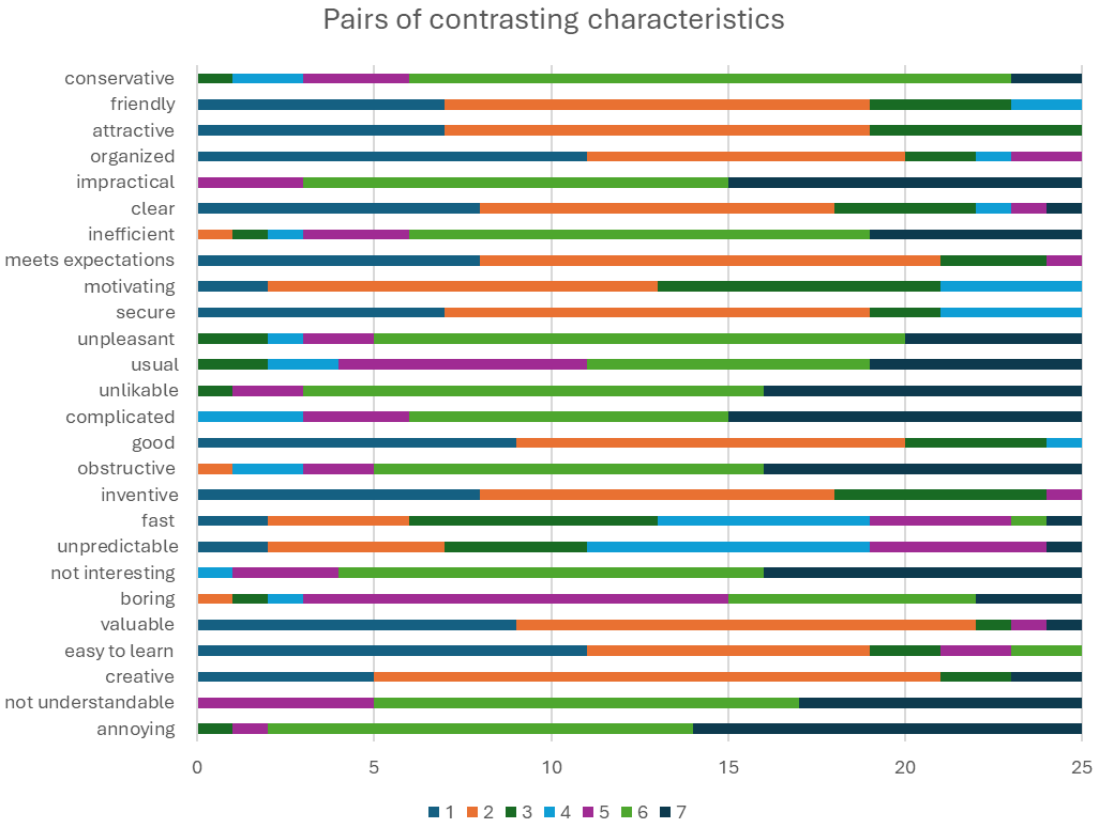


Figure 39. Results of pairs of contrasting characteristics

Table 2. Pairs of contrasting characteristics average

Value: low-1	Average	Value: high-7	Value: low-1	Average	Value: high-7
Good	1,88	*Bad*	*Fast*	3,52	*Slow*
Meets Expectations	1,92	*Does Not Meet Expectations*	*Boring*	5,28	*Exciting*
Organized	1,96	*Cluttered*	*Usual*	5,56	*Leading Edge*
Attractive	1,96	*Unattractive*	*Conservative*	5,68	*Innovative*
Valuable	2,00	*Inferior*	*Inefficient*	5,76	*Efficient*
Inventive	2,04	*Conventional*	*Unpleasant*	5,80	*Pleasant*
Friendly	2,04	*Unfriendly*	*Obstructive*	5,96	*Supportive*
Secure	2,12	*Not Secure*	*Complicated*	6,04	*Easy*
Easy To Learn	2,20	*Difficult To Learn*	*Understandable*	6,12	*Understandable*
Clear	2,24	*Confusing*	*Uninteresting*	6,16	*Interesting*
Creative	2,28	*Dull*	*Unlikable*	6,16	*Pleasing*
Motivating	2,56	*Demotivating*	*Annoying*	6,28	*Enjoyable*
Unpredictable	3,52	*Predictable*	*Impractical*	6,28	*Practical*

Overall, the results show a clearly positive evaluation of the virtual museum. Attributes such as *good*, *meets expectations*, *organised*, *attractive*, *valuable*, *friendly*, *clear*, and *easy to learn* obtained average scores close to the most positive end of the scale. Likewise, the experience was perceived as *interesting*, *pleasant*, *enjoyable*, *practical*, and *supportive*.

The second part of the questionnaire included a set of questions evaluated using a Likert scale ranging from “Not at all” to “Very much”. Figure 40 presents the distribution of responses for each question as percentages. The questions are as follows:

1. How knowledgeable were you about wood carving before visiting CETEM and/or using the virtual map?
2. How much do you think this virtual map helped you learn more about wood carving?
3. How much do you think this virtual map made you want to learn more?
4. Would you search for and visit wood carving workshops in Yecla as a result of your experience visiting CETEM and using the virtual map?

5. Would you visit other places related to wood carving as a result of your experience visiting CETEM and using the virtual map?

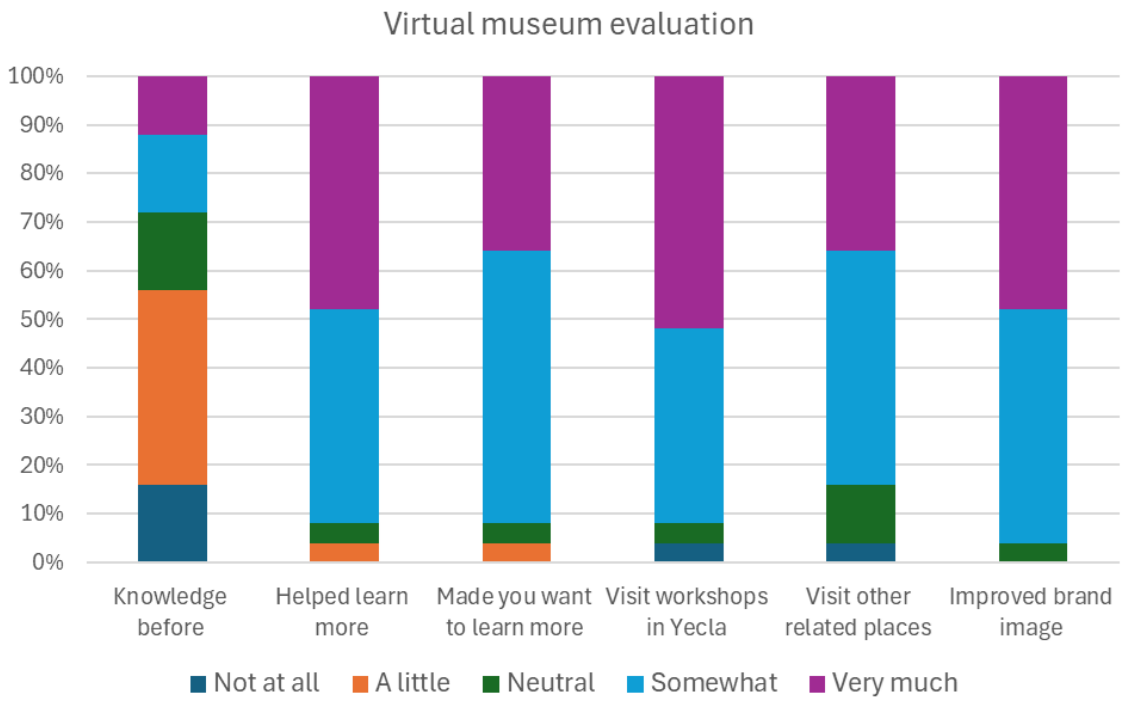


Figure 40. Virtual Museum Evaluation

The average values for each question are summarised in Table 3. Results indicate that participants reported a moderate level of prior knowledge about woodcarving before using the virtual museum (average score: 2.68). In contrast, the virtual museum scored highly in terms of supporting learning (4.36), stimulating further interest (4.24), and encouraging visits to woodcarving workshops in Yecla (4.36) or to other related places (4.12). In addition, participants perceived that the virtual museum positively contributes to Yecla's brand image (4.44), reinforcing its value as a dissemination and valorisation tool.

Table 3. Average score per response.

Questions	Score (avg)
1. Knowledge before	2,68
2. Helped learn more	4,36
3. Made you want to learn more	4,24
4. Visit workshops in Yecla	4,36
5. Visit other related places	4,12
6. Improved brand image	4,44

A final question asked participants to rate their overall satisfaction with the virtual museum on a scale from 0 (Not at all likely) to 10 (Extremely likely). The minimum score recorded was 6, selected by only one participant. As shown in Table 4, the overall average satisfaction score was 8.32, indicating a high level of acceptance. Satisfaction levels were slightly higher among CETEM participants (8.40) compared to external visitors (8.20). Notably, participants from outside Yecla reported the highest average satisfaction (8.71), compared to participants from Yecla (8.16), highlighting the platform's particular effectiveness for audiences unfamiliar with the local context.

Table 4. Average satisfaction per participant group

Participants	Satisfaction (avg)
General group	8,32
CETEM participants	8,40
External participants	8,20
Yecla participants	8,16
Out of the Yecla participants	8,71

Finally, participants were invited to provide open-ended feedback on what they liked most (Table 5) and least (Table 6) about the virtual museum. The qualitative responses reinforce the quantitative results. Positive comments frequently highlighted the immersive 360° experience, the freedom of navigation, the visual and aesthetic quality, the combination of historical and contemporary content, and the opportunity to access spaces and craft objects that are otherwise difficult to visit. Both CETEM participants and external visitors valued the educational clarity, the integration of videos, and the strong link between craftsmanship, industry, and local identity.

Table 5. Comments on what participants liked the most

External visitors
The innovative idea of exploring and learning about Yecla.
The combination of modern and attractive spaces; it clearly shows how wood and furniture work is developed.
The aesthetic and graphic aspect.
Learning about Yecla and the process behind its furniture.
The possibility to move through the different rooms and entering them to view the information they contain.
The wood workshop.

The quality of the work done and the very interesting information about wood carving and furniture, as well as the effort made to make everything visually engaging. The background music also creates a very pleasant atmosphere that accompanies the whole experience.

The wood workshop and seeing how craftsmanship is still alive in this field, as well as the quality of the work.

The fact that you can enter the rooms as if you were actually there, clearly see everything and understand what each room is for and how it works.

Being able to access places and artistic pieces that are not easy to access, and learning about the history of such an uncommon and hard-to-reach place.

I liked the Furniture Fair section, then CETEM, the Tullido Castle, and finally the Town Hall. I really liked the different videos and the carving samples on display. It was a bit confusing in terms of the different doors; sometimes you don't know where you are or whether you have already entered.

External visitors

It seems like a very instructive, clear and entertaining museum. It is well thought out to let you learn everything related to the furniture sector in Yecla.

I found it very interesting that it includes explanatory videos and that it does not limit itself to talking about the present, but also looks at the past to show how Yecla has evolved to become what it is today (regarding the furniture and wood sector).

The visit to the Town Hall Square and its explanations.

The music is great.

The information points out specific details of each place.

Learning about and seeing the best of Yecla.

Being able to navigate freely through the information and decide what to see at any moment according to personal interest.

The way you can move around the museum.

Ease of use and the information provided.

The amount of information and the possibility of moving freely.

The interactivity and the visual design.

The navigation and the available information.

The 360° virtual tour.

The immersive experience.

The strong combination of educational and informative content stands out, together with its accessibility and the visual experience of being able to tour the rooms in 360°. This museum brings citizens closer to their city.

Regarding negative aspects, feedback primarily focused on technical and usability issues, including loading times, overlapping background music with videos, the absence of an audio guide, and occasional navigation difficulties. Importantly, several participants stated that there was nothing they disliked, suggesting a generally high level of acceptance and satisfaction. Overall, the qualitative feedback provides clear guidance for future improvements while confirming the strong educational and experiential value of the virtual museum.

Table 6. Comments on what participants liked the least

External visitors
The lack of more images inside the building.
The distribution of information, which is somewhat complex.
Nothing in particular; it seems like an innovative experience.
The horizontal screen view could be improved compared to the vertical screen view.
Nothing specific; perhaps it would be interesting to improve the lighting in some areas or rooms.
What I liked least is that the website takes time to load.
The videos are repetitive and without voice, and sometimes it is somewhat difficult to navigate through the different spaces.
The Town Hall seemed very poor to me, without videos, with images that are not displayed well; I really missed having some video. The furniture and its details are better appreciated. I really like the video in the assembly hall and the music as well.
CETEM participants
I think it would be good to increase the interaction between the user and the website itself.
There is nothing I didn't like. I found it very interesting and very clear in its explanations.
The visit to the Furniture Fair and the lack of information about the carved wood exhibition, as well as issues with the background music overlapping with the explanatory videos.
It is a bit slow when loading each section.
The music does not fade when playing videos.
The background music.

Nothing in particular.
It does not have an audio guide.
The music.
That the sound can be annoying.
The absence of an audio guide.
Nothing.

The evaluation results demonstrate that the virtual museum is a highly effective tool for the valorisation and dissemination of Yecla's woodcarving and furniture heritage. Both quantitative and qualitative data confirm that the platform succeeds in combining educational content, visual immersion, and user-friendly navigation, resulting in high levels of satisfaction and perceived usefulness.

One of the most relevant findings is the platform's strong impact on learning outcomes and motivation. Participants reported that the virtual museum significantly enhanced their understanding of woodcarving and increased their interest in learning more, as well as their willingness to visit workshops and related locations. This confirms the platform's potential not only as a digital exhibition, but also as a gateway to physical visits and further engagement with local heritage.

The results also highlight the particular value of the virtual museum for audiences from outside Yecla. Higher satisfaction scores among external participants indicate that the platform effectively contextualises local heritage for newcomers, making it a powerful tool for cultural mediation, tourism, and international dissemination.

The testing process played a crucial role in enhancing the quality of the virtual museum. Feedback provided by CETEM staff, students, and external visitors enabled the identification and correction of usability issues, content inconsistencies, and minor errors in both the Spanish and English versions of the platform. The constructive and detailed comments from participants were particularly valuable in refining navigation, audiovisual elements, and textual content, contributing to a more coherent and robust final version of the virtual museum.

The evaluation identifies areas for improvement, mainly related to technical performance and interaction. Suggestions such as improving loading speed, refining audio management, and incorporating an audio guide point to clear and feasible enhancements that could further strengthen the user experience and reinforce the perception of innovation.

In conclusion, the virtual museum successfully fulfils its role as a valorisation, educational, and dissemination instrument, bridging tradition and innovation. Its positive reception by diverse user profiles, combined with clear pathways for improvement, confirms its relevance, scalability, and potential for long-term impact.

4.4 360 tour application

This section presents the Margarites application, a pilot digital experience developed to document, communicate, and promote the ceramic heritage of Margarites, a traditional pottery village in Rethymno, Crete. The application forms part of CRAEFT's broader exploration of how digital tools can support cultural tourism, craft valorisation, and the transmission of intangible cultural heritage by situating craft practices within their authentic spatial and social contexts.

The Margarites 360° tour is delivered as a web-based experience (desktop and mobile), enabling immediate access without installation. The online page below provides the interactive tour, including navigation across scan points and the embedded Tags used to highlight points of interest and outbound links.

Online 360° tour (Margarites, Matterport): https://my.matterport.com/show/?m=D2M62PKucf6

Unlike institution-centred museum applications, the Margarites case focuses on a living craft settlement, where multiple workshops coexist within a shared public space and where everyday production remains visible and active. The application, therefore, adopts a spatial and place-based perspective, aiming to represent not only individual craft environments but also their relationships within the village fabric. By enabling remote exploration through immersive 360° documentation, the experience supports both pre-visit discovery and post-visit reflection, while remaining accessible to diverse audiences.

Implemented as a side pilot within the project, the Margarites application explores an alternative development pathway based on an existing commercial platform rather than custom software development. This choice allows the project to examine trade-offs between flexibility, sustainability, and ease of deployment, while maintaining alignment with CRAEFT's objectives for accessibility, scalability, and low technical burden for local practitioners. The following subsections describe the requirements, design rationale, implementation approach, and evaluation of the Margarites application in detail.

4.4.1 Requirements

The Margarites application addresses the need to document, present, and disseminate traditional ceramic craft environments in a way that is accessible to broad audiences while remaining faithful to the spatial and social reality of the craft. Margarites is a living craft village rather than a single institution, and therefore requires a representation that captures continuity, everyday practice, and the coexistence of multiple workshops within a shared public space.

From the visitor's perspective, a key requirement is the ability to explore the village and its pottery tradition without prior physical presence. Many potential visitors lack contextual knowledge of where workshops are located, how they relate spatially to one another, and what distinguishes one craft space from another. The application, therefore, needed to support intuitive spatial navigation, visual continuity, and the possibility to move freely between locations, closely resembling an on-site walking experience.

In addition to off-site exploration, a key functional requirement was the ability to access the tour on a mobile device during an on-site visit. In this "companion" mode, the experience should support quick,

low-friction access (no installation), allow users to orient themselves along the village route, and provide lightweight contextual cues at points of interest. This dual-use requirement (on-site and off-site) shaped both the platform choice and the information strategy, favouring a web-delivered interface with minimal operational overhead.

From the practitioners' and community perspective, the solution had to remain lightweight, non-intrusive, and respectful of daily work routines. Local potters could not be expected to engage with complex authoring tools, extended digitisation processes, or custom software maintenance. The requirements, therefore, favoured a solution that minimised technical overhead while still enabling accurate representation, basic annotation, and outward-facing visibility for individual workshops.

At a strategic level, the application needed to support CRAEFT's objectives for cultural tourism and heritage valorisation by linking intangible knowledge (tools, techniques, and craft identity) with tangible spatial context. Rather than offering abstract descriptions of pottery making, the experience had to situate knowledge within real environments, reinforcing the connection between place, practice, and community. The solution also needed to scale easily to similar villages or craft clusters without requiring bespoke development for each case.

4.4.2 Design

The design of the Margarites application follows a spatial-first approach, prioritising realism, continuity, and ease of exploration over interactive complexity. Instead of a custom-built interface, the design leverages Matterport's established 360° capture and navigation paradigm, which closely resembles natural human movement through space. This choice aligns with the requirement to represent Margarites as a living village rather than as a curated exhibition.

The core design concept is that of a continuous digital walk. The central street of Margarites acts as the primary narrative spine, allowing users to progress naturally from one workshop to another. This design reinforces the perception of Margarites as an interconnected craft ecosystem rather than a collection of isolated points of interest. The detailed capture of a representative pottery workshop complements this street-level overview by allowing deeper inspection of tools, products, and working arrangements.

Information design is intentionally minimal and contextual. Matterport Tags are used sparingly to annotate selected tools, ceramic objects, and workshop entrances, ensuring that textual information enhances rather than disrupts spatial immersion. Tags function as optional layers of interpretation: users may choose to explore visually only or engage more deeply by opening descriptions and external links. This balances exploratory freedom with guided learning.

A further design decision was to treat POI markup as *lightweight identification and routing* rather than full interpretive documentation. In practice, this meant (a) marking craft-relevant locations along the route (workshops/shops) and (b) attaching verified outbound links (official websites or social media pages) where available. This approach strengthens valorisation and visit planning while keeping the annotation workload modest, and leaves room for future enrichment (e.g., longer descriptions, curated narratives, or multilingual content) without changing the underlying spatial capture.

The overall design avoids heavy gamification, menus, or task-based interaction. Instead, it supports self-paced discovery, which is more appropriate for cultural tourism and informal learning contexts. By relying

on a familiar, web-accessible interface, the design ensures accessibility across devices and user profiles, including non-technical audiences. At the same time, the design remains transferable: the same structural logic, that is *continuous spatial capture, selective annotation, and workshop-level visibility*, can be applied to other craft villages or cultural routes.

4.4.3 Implementation

The Margarites application follows a similar conceptual approach to the Yecla experience, offering an immersive 360° digital tour of craft-related environments. It adopts a different implementation pathway by using a commercial solution, Matterport, instead of a custom-developed system. Designed as a side pilot within the CRAEFT project, the application documents and presents the ceramic heritage of Margarites, a village in Rethymno, Crete, renowned for its long-standing pottery tradition and active community of artisans. The virtual tour was implemented through Matterport's automated 360° spatial reconstruction tools, providing an accessible and high-quality environment for exploring real craft spaces.

The areas selected for recording focus on the central street of the village, where most pottery workshops and craft shops are concentrated. This main route was chosen because it represents the core of the village's ceramic activity and offers a continuous, walkable path suitable for structured 360° capture. One pottery workshop, the Kerameion, located directly on the central street, was documented in detail to showcase a representative working environment, including characteristic tools, products, and spatial arrangements. Together, the central street and this workshop offer a realistic portrayal of the everyday craft life and architectural character of Margarites while providing a coherent spatial context for the virtual tour.

High-resolution 360° panoramic images were captured along the selected route, with each capture point positioned approximately four to five steps apart. This spacing ensured sufficient visual overlap between consecutive photographs, which is essential for Matterport's alignment algorithm to accurately match shared features and reconstruct a unified 3D model. Once the on-site recording was completed, Matterport automatically processed the entire dataset by stitching the images into navigable nodes, aligning them spatially, generating a full three-dimensional 'dollhouse view,' and producing a floor-plan representation of the area. This automated pipeline resulted in a seamless and spatially accurate reconstruction without the need for manual calibration or additional modelling work.

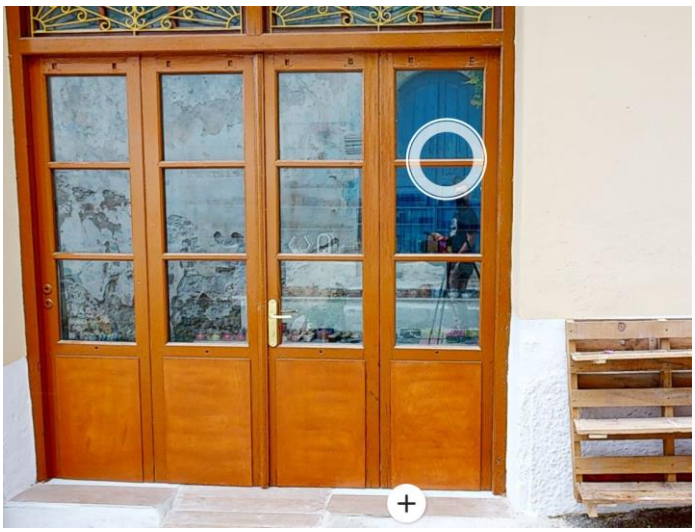


Figure 41. Margarites 360° tour. Example capture nodes along the village route. The images illustrate typical street-level capture position used to ensure visual overlap and continuous navigation along the main path. The circular tag marker indicates an annotated point of interest; selecting the marker reveals the associated information panel and online link to the local business.

After the automated reconstruction, informational content was added using Matterport's Tags feature. Tags were placed to highlight selected pottery tools and ceramic products inside the workshop, accompanied by concise descriptive notes that support users in understanding key aspects of the ceramic craft. Additionally, all pottery shops along the recorded street were annotated with Tags, including their official business names and direct links to their websites or social media profiles, ensuring accurate identification of each shop and offering users immediate access to verified external resources. This enhances both the informative value of the virtual tour and the visibility of the local craft community.

Tags were created for the main craft-related and visitor-facing locations encountered along the recorded street. Table 7 lists the POIs currently tagged in the Margarites tour, together with their external reference links (where available).

Table 7. Tagged points of interest in the Margarites 360° tour (examples and outbound links)

Point of interest	Link (site / social)
Koumoulia	www.koumoulia.gr
Kerameion	https://keramion.gr/
Asimenia	https://asimeniaceramics.gr/en/home/
Lucky Pot Ceramic Studio	https://www.instagram.com/luckypotceramicstudio/?hl=en
Giannis Ceramics	https://www.instagram.com/giannis_ceramics/
EA Ceramic Studio	https://www.eaceramicstudio.com/
Bizoudaki Handmade Creations	https://www.instagram.com/bizoudaki_handmadecreations/?hl=en ; https://www.facebook.com/bizoudakipage
Sweet Margarita	https://www.instagram.com/sweetmargaritarethymno/
Taverna Giannousakis	https://www.facebook.com/profile.php?id=100070266608701
Mantalos Cafe–Taverna	https://www.instagram.com/explore/locations/1006134291/mantalos-cafe-taverna/
Ergani	(link not available at time of tagging)
Aphrodite	(link not available at time of tagging)
Enthymion	(link not available at time of tagging)

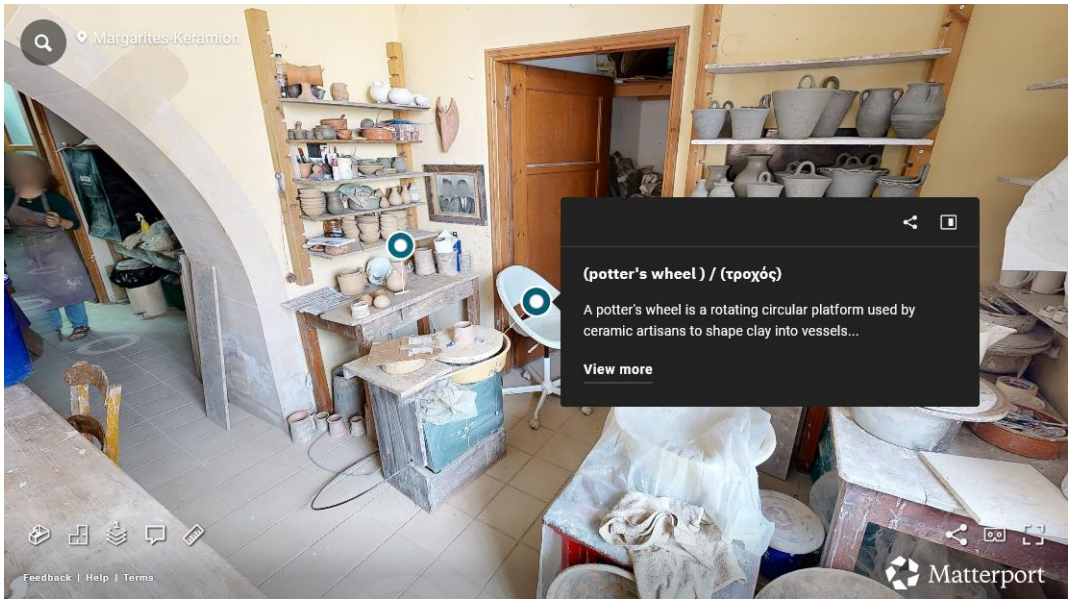


Figure 42. Hovering over a tag

Figure 43. Viewing information about a tool

4.4.4 Evaluation

Given its role as a side pilot within the CRAEFT project, the Margarites application was evaluated through a qualitative, expert-based assessment rather than through large-scale user studies or formal quantitative measurements. This evaluation approach was considered appropriate for an exploratory case that aimed primarily to validate feasibility, design choices, and cultural adequacy, rather than to measure behavioural impact or learning outcomes at scale.

The evaluation was conducted in a controlled laboratory setting at FORTH and involved domain experts with complementary backgrounds in cultural heritage digitisation, immersive media, user experience design, and craft-related research. These experts were already familiar with the objectives of CRAEFT and with comparable digital heritage applications, enabling them to assess the Margarites experience both critically and contextually. The expert sessions combined guided walkthroughs of the virtual tour with open discussion and reflective feedback.

During the walkthroughs, experts explored the 360° environment as end users, navigating along the central street of Margarites and entering the documented pottery workshop. Particular attention was paid to the sense of spatial continuity, the clarity of navigation, and the degree to which the experience conveyed the village as a living craft ecosystem rather than as a static exhibition. The placement and density of informational Tags were also examined, with experts assessing whether annotations supported understanding without interrupting immersion or overwhelming the visual experience.

Discussion focused on three main dimensions. First, cultural adequacy: experts evaluated whether the representation respected the character of Margarites as an active craft community and avoided over-curation or aestheticisation detached from everyday practice. Second, usability and accessibility: the team examined whether the Matterport-based interface was intuitive for non-technical audiences and suitable for use across devices without additional guidance. Third, strategic relevance: experts reflected on the application's potential role in cultural tourism, particularly as a pre-visit exploration tool and as a mechanism for increasing the visibility of individual workshops without imposing technical demands on practitioners.

Overall, the expert evaluation confirmed that the chosen approach was fit for purpose within the constraints of a side pilot. The use of an off-the-shelf immersive platform was seen as an effective compromise between quality, sustainability, and deployment effort. Experts highlighted the strength of the spatial narrative and the value of embedding craft knowledge directly within real environments. At the same time, the evaluation surfaced limitations inherent to the approach, including restricted customisation of interaction logic and limited possibilities for structured learning activities or data collection.

Rather than viewing these limitations as shortcomings, the expert group framed them as defining characteristics of a lightweight, place-based documentation tool. In this sense, the evaluation reinforced the role of the Margarites application as a complementary component within CRAEFT: not a replacement for fully interactive or pedagogically driven systems, but a scalable and culturally sensitive means of capturing and communicating living craft heritage. The insights gathered through this expert-based evaluation informed reflections on transferability and sustainability, supporting the application's positioning as a model for similar craft villages and cultural routes.

As a practical follow-up, a small on-site walkthrough is recommended in Margarites with 2–3 internal participants, using smartphones to access the tour in situ. This would (i) validate the intended dual-use scenario (on-site vs off-site), (ii) check network/performance assumptions under realistic conditions, and (iii) produce photographic evidence of real use (e.g., users consulting the tour while moving along the recorded route) for inclusion in CRAEFT dissemination material and pilot reporting.

4.5 Cultural Tourism Promotion DIY Platform

This use case reports the Cultural Tourism Promotion DIY Platform: a lightweight toolchain for producing and maintaining a conventional web presence for introductory craft experiences and related cultural-tourism activities. The platform is designed to reduce the technical barrier for non-technical stakeholders, such as workshop owners, local organisers, and regional development staff. This is achieved by separating (i) content entry and updates from (ii) website generation and deployment. In CRAEFT, the platform supports valorisation by helping craft-related activities become discoverable, comparable, and plannable alongside other tourism offerings.

A web platform development tool was developed to increase the accessibility and automation of the web presence of introductory crafting experiences. This tool simplifies data and image entry through easy-to-use forms, without technical knowledge. The information is then organised in a way that complies with cultural tourism services. The primary goal is to enable workshop owners to link their outreach activities with tourism activities (such as excursions and sightseeing) and market them alongside other tourist experiences. Regional authorities, who support the local economy, represent the secondary audience for this tool.

Section 4.5 is organised as follows. Section 4.5.1 motivates the tool and clarifies the target user roles. Sections 4.5.2 and 4.5.3 provide an overview of the toolchain and the design decisions that support reuse across locations. Section 4.5.4 presents the CRAEFT-led reference deployment for Crete that includes functional output and illustrative pages. Sections 4.5.5 and 4.5.6 then strengthen the evaluation by reporting two utilisation-based studies (Rhodes and Zagora), where independent student users reused the CRAEFT toolchain as a software product in order to simulate realistic adoption outside the originating team. Finally, Section 4.5.7 synthesises lessons learnt and states the resulting improvement backlog.

To support reuse and inspection of the Cultural Tourism Promotion DIY Platform, the implementation is made openly available as a public code repository. Detailed, step-by-step usage instructions (including deployment and operation) are provided in Annex G.

Source code (GitHub): https://github.com/Kleomen/Thesis-Cultural-Tourism-Activities

4.5.1 Rationale and target users

Cultural activities are inherently place-based: a workshop, a festival, or a small community initiative derives its meaning from the local actors who organise it and the social setting in which it occurs. In practice, however, these activities are often *digitally fragmented*. Small events and “give-it-a-go” crafting opportunities are promoted through ad-hoc channels—posters, dispersed social-media posts, informal messaging, and word-of-mouth—making discovery and trip planning difficult for visitors, while also limiting visibility for local organisers.

This use case focuses on *introductory crafting experiences* embedded in cultural tourism, where discovery should naturally lead to participation. Enabling visitors to encounter pottery, jewellery-making, or culinary practice bridges “what is happening here?” with “what can I try?”, and supports a form of cultural tourism that is experiential rather than purely consumptive. At the same time, many practitioners and small

organisers do not prioritise, and often cannot sustain, complex digital infrastructures. They typically prefer a simple, conventional web presence that can be updated quickly and maintained with minimal effort, rather than highly interactive or "high-tech" solutions that impose ongoing workload.

The platform is designed to address these constraints by (i) providing a simple, form-based workflow for entering and updating content and (ii) automatically generating a structured website with a coherent information architecture (activities, maps, and basic itinerary support). The absence of a centralised repository of local event information is treated as a core barrier to valorisation; the platform responds by aggregating event data, supporting multilingual deployment, and presenting activities in a format explicitly optimised for discovery and planning. The technical contribution is therefore not novel interactivity, but **simplicity and automation**, aligned with the reality that some stakeholders have limited time, limited technical inclination, or limited interest in maintaining digital systems.

Two primary user roles are targeted:

- **Practitioners and workshop owners**, who benefit from improved discoverability and a stable "home" for promotional material that is easier to update than scattered posts across multiple channels.
- **Regional and collective organisations** (e.g., destination-management bodies, regional development actors), who benefit from aggregating multiple offerings and presenting them as a coherent portfolio for visitors and stakeholders.

Operationally, the platform aims to "meet users where they are": it prioritises a small number of simple steps: enter or update content, regenerate pages, redeploy. This design choice supports sustainable adoption and makes the system straightforward to parameterise for different styles and regional identities. Methodologically, the approach provides a replicable, transferable model for other regions and cultural activity portfolios, while remaining aligned with heritage and valorisation objectives: raising practitioner visibility, supporting diversified income streams, and embedding craft practice within sustainable cultural economies.

Finally, the Experiences page adds an explicitly human layer to the platform. By foregrounding lived accounts from visitors and locals, it strengthens cultural connection and provides social cues that encourage new users to participate in similar activities, complementing the informational functions of listings, maps, and planning tools.

4.5.2 Design for reuse across locations

The platform is designed to be reconfigured for different locations primarily by replacing content (texts, images, and activity entries) rather than rewriting code. In practice, reuse is supported through:

- A small set of page templates that remain stable across deployments (home, "about the region", activities, map, and a selection/itinerary view).
- Structured content files (JSON) that act as the single source of truth for activity entries and map markers.
- A predictable project structure that separates data, media assets, localisation resources, and page components.

- Optional multilingual scaffolding (where required by the deployment), enabling the same content structure to be presented in multiple languages.

This design supports CRAEFT's emphasis on transferability: the same toolchain can be appropriated by new users to represent different cultural ecosystems while preserving a coherent visitor-facing interaction model.

4.5.3 Toolchain and implementation overview

The platform follows a modular, open-source web architecture designed for reuse across locations and activity portfolios. The front end is implemented in React, with page-level templates and reusable components that support the core interaction patterns of the use case (e.g., activity listings, an interactive map view, and an itinerary/selection view). Tailwind CSS is used for styling, providing a consistent, responsive layout across devices. Navigation is implemented through standard client-side routing (e.g., React Router), enabling smooth transitions between sections without full page reloads.

For geospatial presentation, the platform uses React Leaflet with OpenStreetMap basemaps. This choice avoids dependencies on commercial mapping services, thereby eliminating API-key management and recurring billing, and aligns with the project's emphasis on lightweight, replicable deployments.

Content is populated and maintained through a deliberately simple data-to-pages pipeline. Users enter or update entries via online forms (implemented with Google Forms), where date and location capture are supported by familiar calendar and map widgets. The resulting tabular export (e.g., CSV) is then converted into structured JSON, which the React application consumes to generate pages consistently and to populate the map and listings without manual editing of HTML. This workflow keeps the operational steps few and robust: *enter/update content → export → convert → (re)deploy*.

Resource map:

- **Data entry (authoring):** Online forms (Google Forms) for activities, events, locations, and media references
- **Data export:** Tabular file (CSV or spreadsheet export)
- **Transformation:** Conversion scripts that validate/format entries and produce structured JSON
- **Web application:** React front end that renders pages, listings, and map views from JSON
- **Mapping layer:** React Leaflet + OpenStreetMap basemaps
- **Deployment:** Static hosting/web server (documented step-by-step in Annex G)

Annex G provides the complete workflow, repository structure, and deployment procedure, including the expected data schema and practical instructions for reproducing or adapting a deployment. Overall, the toolchain validates that a lightweight, open-source stack can deliver culturally meaningful tourism pages with minimal operational overhead, while remaining maintainable and extensible (e.g., multilingual deployments or integration with event-management backends when such infrastructure is available).

4.5.4 Application Design

Geospatial features were delivered through React Leaflet[1], an open-source alternative to commercial mapping services. This decision avoided dependency on external billing systems and ensured greater sustainability. The integration of interactive maps allowed events to be represented by markers, each linked to detailed pop-ups with event names and locations. All development was version-controlled via GitHub, ensuring traceability and reproducibility.

The application is organised into reusable components and thematic pages: a homepage with a slider, an About Rhodes section contextualising local heritage, an Activities page fed dynamically from JSON, a Maps page with event markers, a Plan Your Trip section for itinerary management, and an Experiences page showcasing testimonials and lived encounters. These components are reflected by the project structure, in directories for data, media, localisation, and functional page templates. Essentially, the user replaces texts and images to reconfigure for their use case.

The user-facing architecture was organised into sections, each supporting a different dimension of cultural tourism. The Homepage introduced the platform through a carousel of featured events, creating immediate engagement. The About Page contextualised Crete's cultural, historical, and natural assets, situating events within a broader heritage framework. The Activities Page presented curated listings, workshops, culinary gatherings, and outdoor excursions, arranged in a responsive card-based grid. The Map Page translated these listings into spatial representations, enabling tourists to plan by geography as well as theme. A Trip Planner function offered users the ability to select and manage their chosen activities, displaying them in tabular form for itinerary organisation. Finally, the Experiences Page collected testimonials from past participants, thereby embedding social proof into the discovery process.

The resource aims to motivate craft visibility by widening access and easing aggregation for regional and collective organisations. We specifically intend to incorporate such Events into the ECCCH.

4.5.5 Reference deployment (Crete)

The reference deployment was developed for Crete in order to test end-to-end feasibility: content entry, website generation, and visitor-facing navigation. The resulting pages demonstrate how craft-related offerings (e.g., workshops, culinary activities, local events) can be presented in a format that supports discovery and planning.

Figure 44 shows the generated landing and listing views, illustrating how activities are presented as a curated, image-led catalogue that can be browsed on desktop and mobile.

[1] https://react-leaflet.js.org/

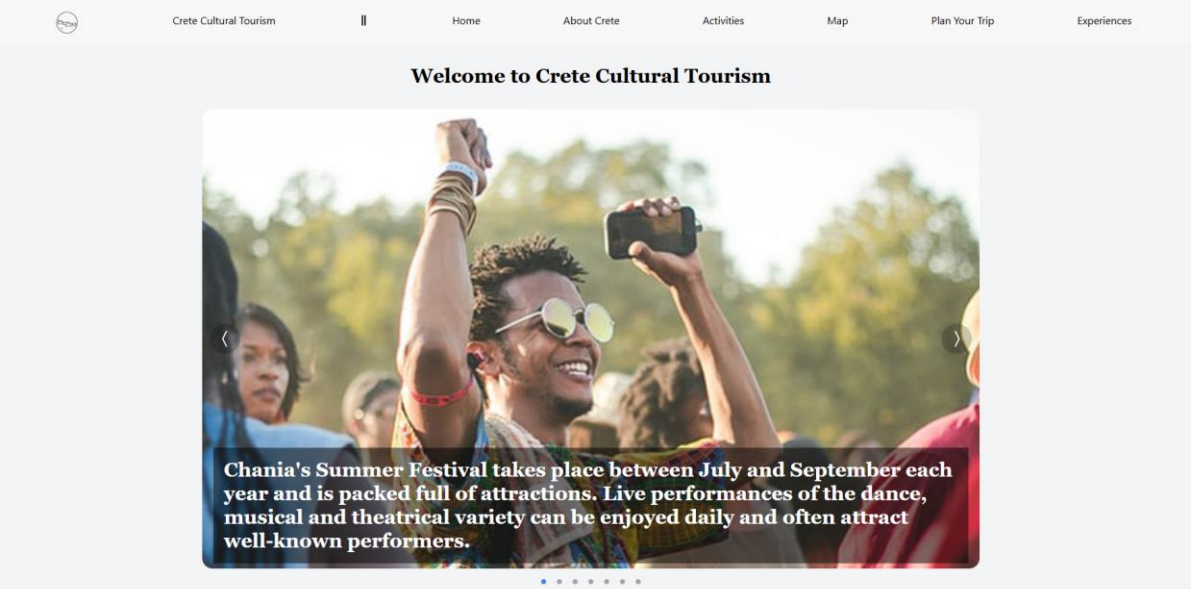


Figure 44. Crete reference deployment. Generated landing page and activity listings produced by the Cultural Tourism Promotion DIY Platform.

Beyond browsing, the platform supports a lightweight "plan your trip" interaction, where users can collect selected activities and review them as an itinerary-style list (Figure 45).

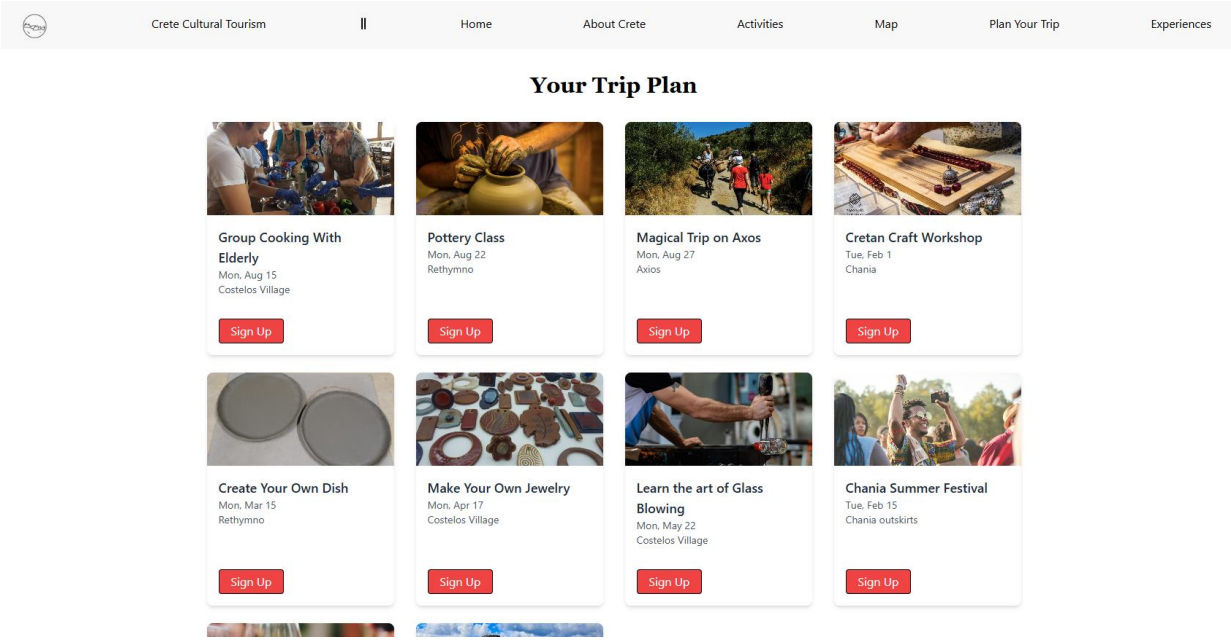


Figure 45. Crete reference deployment. Example itinerary/selection view ("Plan your trip") generated from selected activities.

Figure 46 provides additional examples of automatically generated pages that combine descriptive text with activity suggestions, illustrating how the same templates can represent sites, events, and participatory activities consistently.

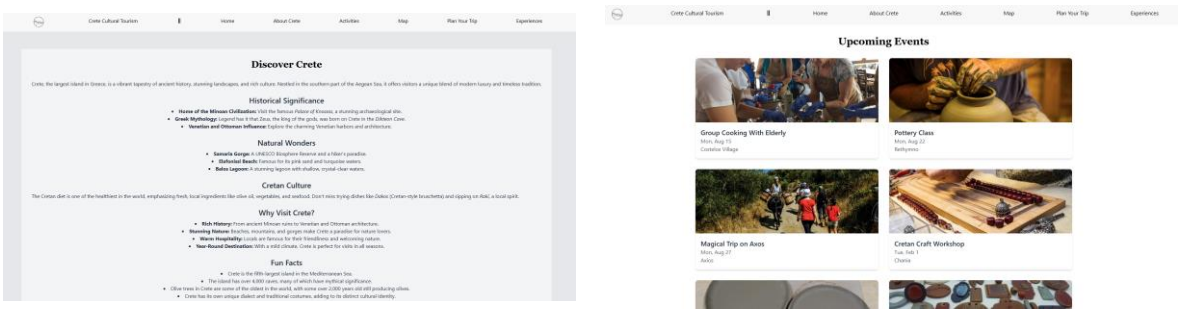


Figure 46. Crete reference deployment. Examples of generated pages for suggested sites, events, and activities, created using (template-based formatting from structured content.

The Crete deployment primarily serves as a functional demonstration. While the content emphasises key cultural features of the region (heritage sites, natural attractions, and local food culture), the main contribution reported here is the reusable mechanism for structuring and publishing activity information rather than the specific editorial selections.

4.5.5 Utilisation-based evaluation I: external reuse for Rhodes

To evaluate the platform as a software product from the perspective of a new user, an external student developed a parallel deployment for Rhodes by reusing the CRAEFT toolchain. The evaluation simulates the work of a regional development employee who must create and maintain a cultural-activities portal for a different location, using the provided documentation and repository assets as guidance.

The Rhodes utilisation case provides evidence for learnability (whether a new user can follow the documented workflow), configuration effort (what must be changed to adapt the platform), and product usefulness (whether the output fits the intended job-to-be-done). Table 8 summarises the evaluation framing and the evidence artefacts to be retained.

Table 8. Rhodes utilisation case. Evaluation framing and evidence artefacts.

Evaluation aspect	What was tested in the Rhodes utilisation case	Evidence artefacts to include
User role simulated	Regional development employee at a different location (Rhodes)	Thesis/report reference; brief scenario description
Core task	Publish and maintain a cultural-activities portal (catalogue + map + planning view)	URL of deployment and/or screenshots
Inputs required	Activity entries (titles, dates, locations, descriptions), media, localisation assets	Example input excerpt (optional; annex)
Workflow followed	Content entry → conversion to JSON → site build → publication	Workflow diagram + build/deploy screenshots
Assessment lens	Learnability and configuration friction (new user perspective)	Short summary of issues and suggested improvements

Figure 47 shows the pages created in the Rhodes case, from highlighting their automatic production after data preparation, media selection, and deployment.

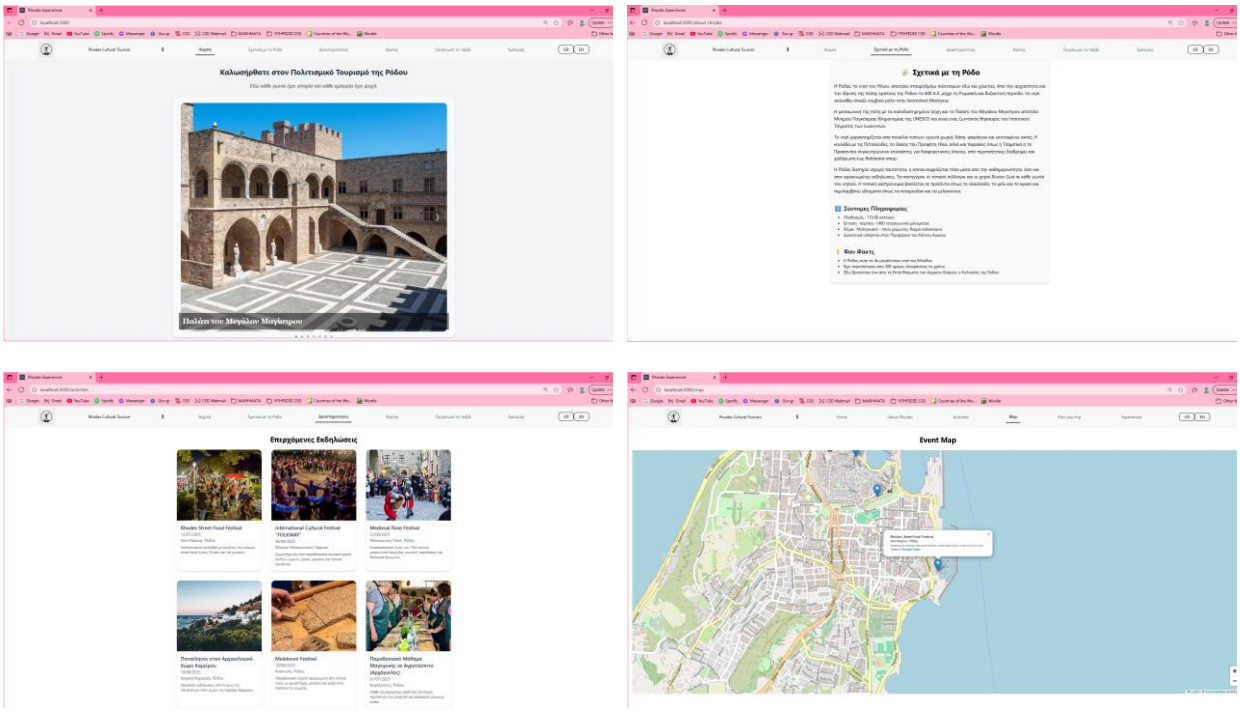


Figure 47. Rhodes utilisation case. Pages instantiated for new content.

Figure 48 shows the visitor-facing output for Rhodes, demonstrating that the same interaction for two personalised pages. The Plan Your Trip page allows users to organize activities according to their interests. Events can be previewed in card format, showing key details such as image, title, date and location. A planning table displays the user's selected activities, offering an overview of their personalized itinerary. The modular structure of this pages allows for future enhancements, such as booking or reservation functionality. The Experiences page highlights more immersive and personal aspects of Rhodes' culture. Testimonials and descriptions showcase local festivals, workshops, and traditional activities. Visual and short narratives provide authenticity and emotional engagement.

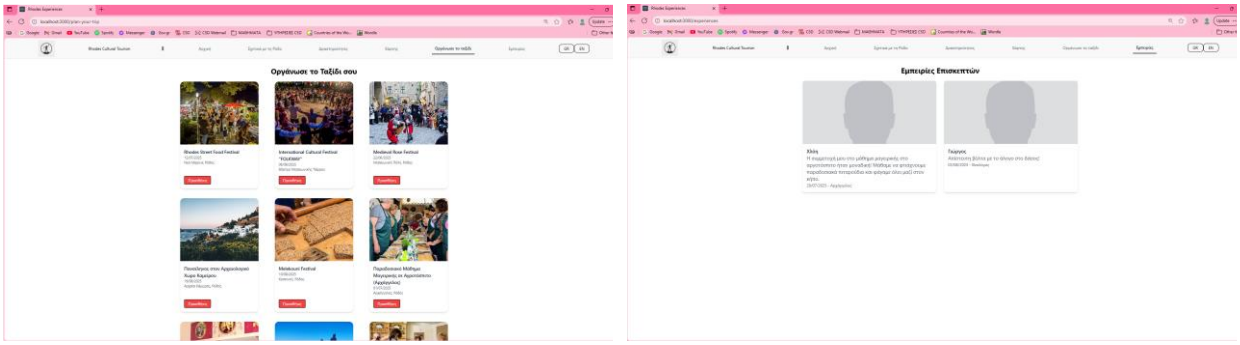


Figure 48. Rhodes utilisation case. External deployment outcome, for personalised generated pages ('Plan your trip' left and 'My Experiences' right).

The Rhodes study case confirmed that the platform can be replicated by an independent user with limited overhead by reusing the existing architecture and replacing the content corpus. This supports our transferability claim by demonstrating adoption outside the originating team. Detailed technical steps and repository guidance are provided in Annex G.

4.5.6 Utilisation-based evaluation II (Zagora)

A second utilisation-based evaluation was conducted through an independent thesis that treated the platform explicitly as a software product and assessed its suitability for deployment by new users. In this case, the evaluator reused the same toolchain to produce two separate deployments: one promotional site for the *Sindetiras* silversmith workshop and one site for the cooperatives of Zagora. This provides stronger evidence than a single redeployment, as it exercises reuse across two stakeholder profiles and two content corpora under the same workflow.

Cultural Platform (culturalPlatform) is a web platform supporting this use case, implemented as a student thesis. It simulates the promotion and dissemination of cultural activities, and includes the source code and a project report documenting the system evaluation, proposed fixes, and future enhancements. The pages for the two use cases implementyed to run the second utilisation-based evaluation can be found in https://github.com/mapantazi/culturalPlatform

The independent evaluation also documented concrete limitations that inform the CRAEFT improvement backlog. Table 9 summarises the reported issues and their implications for future iterations of the platform.

Table 9. Zagora utilisation case. Limitations reported in the independent evaluation and implications for the CRAEFT platform.

Category	Limitation reported	Implication for the CRAEFT platform
Usability	Limited responsiveness across device form factors; weak UI consistency	Prioritise responsive design and standard structural elements to improve navigation on mobile devices
Robustness	Missing "404 not found" handling for invalid URLs	Add explicit 404 routing and basic user feedback for invalid routes
Robustness	Fragility of the data pipeline when input formats deviate	Introduce stricter input templates and validation to prevent pipeline failure
Maintainability	Hard-coded configuration values reduce flexibility	Refactor towards parameterised configuration and separation of concerns
Maintainability	Project-structure choices hinder ongoing development	Adopt a clearer code organisation to support maintenance

The evaluation also proposed upgrade directions aligned with these findings, including: accessibility improvements towards Level AA practices (semantic HTML, contrast, keyboard navigation, alt text); the adoption of a Backend-for-Frontend (BFF) pattern to reduce hard-coded data handling and centralise formatting/aggregation; and optional functional extensions (e.g., user accounts, external API integrations, e-commerce/booking features) where appropriate for specific deployments.

4.5.7 Synthesis and resulting improvement backlog

The CRAEFT-led reference deployment (Crete) and the two utilisation-based evaluations provide complementary evidence: feasibility and functional output in the originating context, and transferability through independent reuse by new users.

The independent evaluation moves beyond a working prototype narrative by identifying robustness, usability, and maintainability gaps that must be addressed to better support regional actors.

The resulting near-term improvement backlog is therefore:

- Responsive layout and UI consistency across devices (including standard structural components).
- Basic route/error handling (including 404 handling).
- Input templates and data validation for the content pipeline.
- Parameterised configuration to avoid hard-coded deployment-specific values.
- Accessibility improvements (towards Level AA practices), where relevant to the hosting organisation.
- Architectural refactoring options (e.g., BFF) if/when the platform evolves beyond static-site deployments.

Longer-term evaluation should target impact measures, such as surveys on tourist engagement, practitioner visibility, and sustained update behaviour, through longitudinal observation with real stakeholders. The utilisation-based evidence already supports Craeft's claim that the platform can be appropriated as a practical tool by new users and redeployed in new contexts.

4.5.8 Discussion

The Crete deployment demonstrates that the proposed platform can consolidate heterogeneous cultural-activity information into a coherent, visitor-facing digital experience. The resulting pages communicate (a) events and experiences and (b) local context and cultural specificity, emphasising year-round availability as a mechanism to counter seasonal overtourism.

The contribution has two sides: discovery and dissemination. For tourists, it offers an accessible overview of cultural opportunities beyond mainstream attractions and supports planning through structured listings and map-based exploration. For practitioners and regional authorities, it provides a practical channel for visibility and coordination, demonstrating how event data can be consolidated and formatted into attractive, reusable web pages with limited editorial overhead. Feedback indicates that users value the clarity of presentation and the ability to surface smaller activities that would otherwise remain difficult to find.

Transferability was first probed through an external utilisation exercise in which an independent user applied the same framework to the island of Rhodes. The objective was to recreate the platform structure, populating it with locally relevant content. This replication served as a robustness check of the modular, React-based architecture and reusable components: the user was able to construct a parallel instance without modifications to the underlying codebase. This demonstrates that the platform can be appropriated by new users, in new regions, to host additional cultural narratives while maintaining a coherent interaction model.

A second utilisation-based evaluation further tested reproducibility and operational fitness through two additional deployments in a different context (Zagora): one targeting the promotion of a silversmith workshop and one targeting local cooperatives. These deployments reinforced that the workflow can be reused across distinct stakeholder profiles, and they also surfaced product-level improvement needs typical of adoption by new users, such as stronger input validation and more robust handling of content and navigation edge cases. These evaluations confirm transferability and contribute with a refinement agenda for moving from a prototype to a maintainable product.

This work should be interpreted as a validated prototype and transferable architectural model. Effects on tourist behaviour, community visibility, and local revenue require longitudinal observation and broader stakeholder engagement. Demonstrating feasibility in Crete and reproducibility across independent deployments (Rhodes and Zagora), the platform establishes a scalable foundation for promoting introductory crafting and cultural experiences across multiple cultural tourism settings, and provides a reference implementation that can be extended through future deployments and evaluation cycles.

4.6 Videos on glass technology, *'The hidden world of glass'*

4.6.1 Requirements

A workshop using Europeana's Impact Playbook was conducted with Cerfav in Paris in October 2024 in the framework of the project's plenary meeting. Discussing who Cerfav's stakeholders are concerning the development of a cultural experience, they first identified students and trainers, tourist offices, and the general public, but we concluded that, for our purposes, the general public would be more suitable. We began by understanding what the general audience that visits CERFAV feels, hears, does, and speaks (Figure 49).

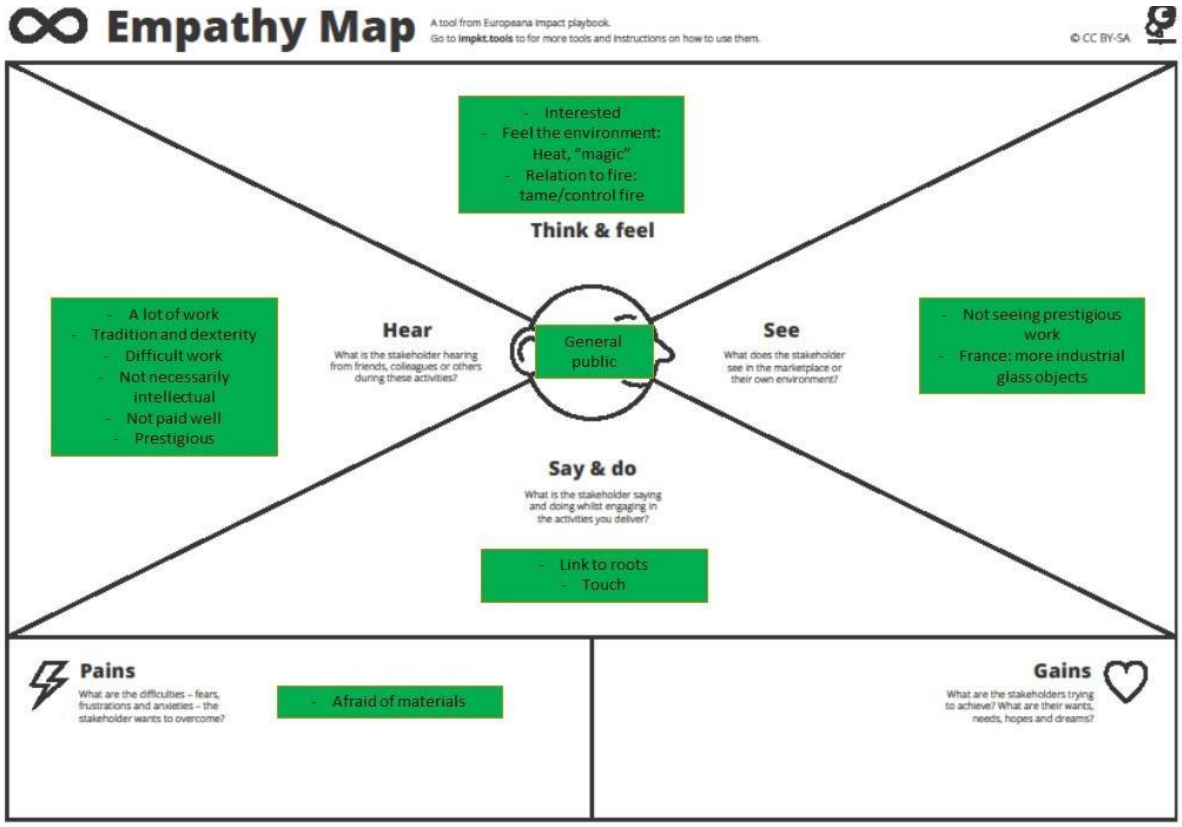


Figure 49. Cerfav's Empathy Map.

CERFAV believes that the general public does not see many prominent glassworks in the market or other environments. They note that in France, most of these objects are industrially made. Contrarily, people hear there are prestigious glassworks that need a lot of work, which is often difficult. Although they might hear that it does not involve intellectual work, they connect it with tradition and dexterity. What they probably say about glassmaking is that it involves the touch sensation and offers a link to one's roots in time (tradition) and place (geography). The general public seems interested in knowing more about this craft, and more precisely, to learn and feel it's making an environment where 'magic' happens among a lot of heat. Furthermore, a craft-specific and intriguing part is the relation to fire and the excitement of taming or controlling it. The excitement, though, can be accompanied by fear towards the materials. After we grasped an idea of who the general public is, we consulted the Value Lenses to come up with the desired outcomes of the planned activity (Figure 50).

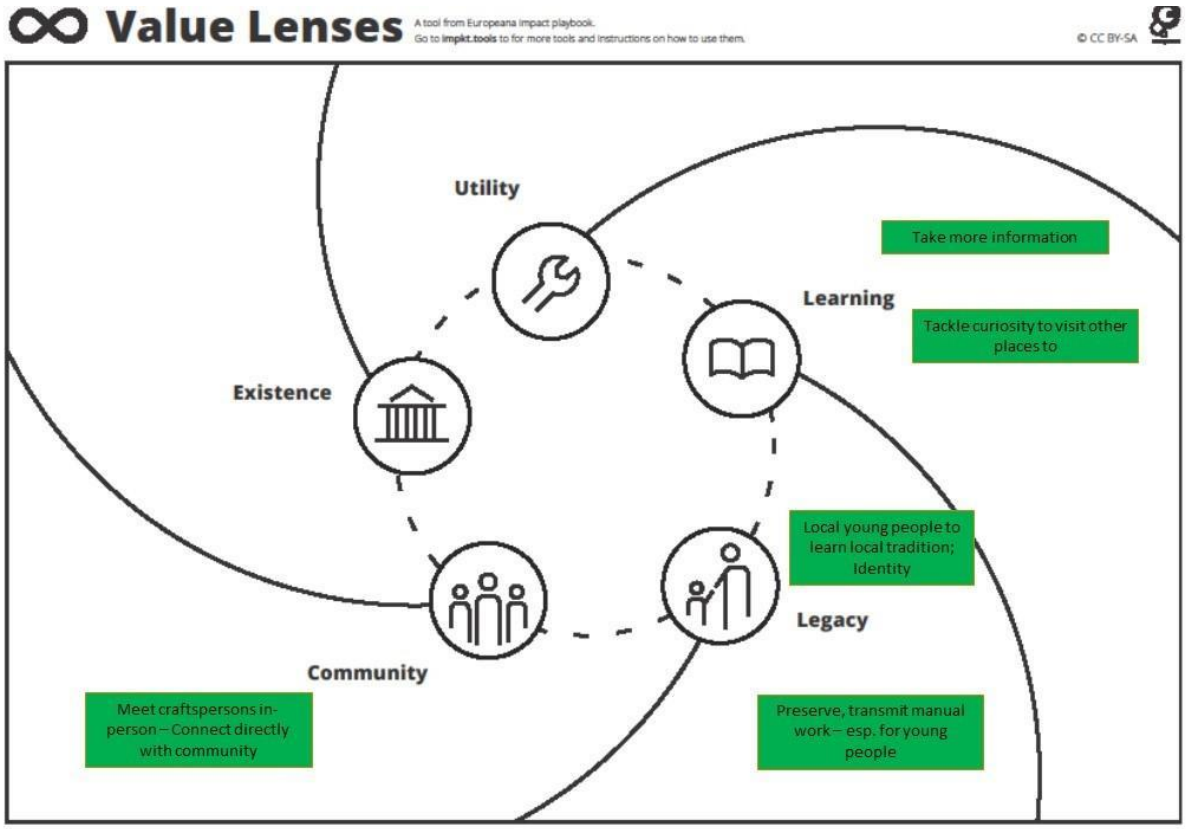


Figure 50. CERFAV's Value Lenses.

CERFAV acknowledges that it wishes to contribute to three main domains. First, they want to offer more information about glassmaking to their visitors and 'nudge' their curiosity to visit even more places related to this craft in other parts of Europe or globally. Second, the legacy and transmission of this knowledge to younger local generations is important for safeguarding the craft. Through the planned activity, they wish to make local young people learn about their traditions and thus, their identity. Last, a direct connection with the community of crafts persons seems significant for perpetuating all the above-mentioned goals.

4.5.2 Design

After identifying these desired outcomes, it was time to place them on the Change Pathway table (Figure 51) and see which are short- and long-term. After discussion, we concluded that offering more information about glassmaking and meeting the crafts persons are short-term outcomes for which CERFAV can be directly accountable for offering through a planned activity. Augmenting the visitors' curiosity and driving them to visit other places related to glassmaking is a long-term outcome for which CERFAV can strive to contribute, but cannot be held accountable. Similarly, knowledge transmission to the younger generation is a long-term outcome to which CERFAV can only contribute up to a certain degree. In those cases, the participants' free will and choice are important and defining factors.

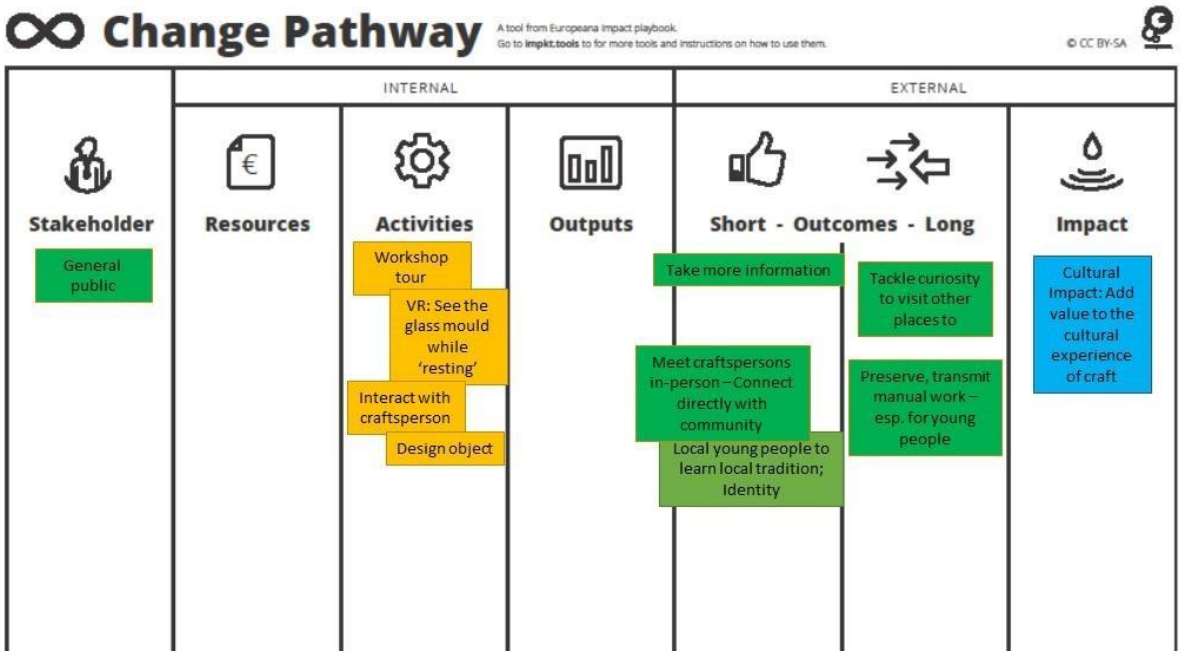


Figure 51. CERFAV's Change Pathway

As CERFAV already has a dedicated space for visitors, including a demonstration workshop area, an exhibition area, and a shop, we decided to follow preconfigured plans and enhance them with elements that will satisfy the outcomes noted in the Change Pathway. The initial elements that Cerfav identifies as desired to be included in the experience are both physical and digital, and include a workshop tour in the demonstration area, interaction with the craftsperson, the possibility to design a glass object, and the opportunity to see what happens to glass as a material while it rests through Virtual Reality (VR). As they explain, this process cannot be seen because the object is enclosed while resting. VR can help the visitor better understand what happens to the glass material and increase their curiosity.

The use case scenario of the experience was co-created with Cerfav's team of the Atelier-Galerie, who are responsible for the institution's public engagement, to enhance their existing facilities: the shop, the blowing workshop, the exhibition space, the existing video trail with the display cases, school group events, etc. The videos on glass technology, 'The hidden world of glass', consist of existing videos showcasing the Vitra or 3D simulations of the inside of a kiln and offer themed screenings. It was decided to complement those with a presentation of the digital tools and other visual material developed earlier in Craeft, such as 3D representations of tools, Twitch sessions, and others.

4.5.3 Implementation

Based on the idea of the previously mentioned use case scenario, editing and subtitling were carried out on the existing videos and rushes by whom. A new complementary video was produced to introduce the digital tools used in Cerfav, such as 3D representations of tools, VR components, and the FabLab YT-TEXTE. Installation took place in the existing exhibition area of Cerfav, which is located near the Atelier-Galerie (Cerfav's shop) (Figure 52).

Figure 52. Exhibition area of glass techniques. Photo: Cerfav.

Figure 53. Video snapshots. Photo: Cerfav.

4.5.4 Evaluation

For the evaluation of the enhanced videos, Cerfav used an existing satisfaction questionnaire enriched with questions targeting Craeft's activities for the Valorisation pilot (Annex B.3). The questionnaire includes demographic data (gender, age, address), previous experience with Cerfav's activities, satisfaction and enjoyment scales, future communication recommendations, and questions regarding Craeft's Valorisation activities. The survey is anonymous.

Further to the survey, the partners from Cerfav conducted an interview (Annex J.3) concerning all the pilot's activities with their primary internal collaborator, the team of the Atelier-Galerie, to grasp their feedback and opinion of the use of digital tools in their everyday practices and the opportunity, or not, to offer more information and boost sales through innovative, intangible means.

The enhanced videos were on display from July to October 2025. The Atelier-Galerie team was responsible for its implementation and monitoring. During that time, Cerfav's regular visitors had the opportunity to watch the videos. According to the Atelier-Galerie team, those were mainly a local audience and tourists with diverse characteristics concerning age, social background, and gender. However, they note that their audience is primarily senior.

Considering the evaluation time frame and the seniority of Cerfav's visitors, it was hard for the team to gather any surveys due to the low number of visitors and to maintain good relations with their customers, without forcing them to fill out questionnaires. Nevertheless, the Atelier-Galerie team pointed out during the interview that the videos were non-intrusive and non-disruptive to their business, which can be considered an added value without extra overload for them. Furthermore, they think that the videos enhance not only the consumer's curiosity but also help trigger the curiosity of younger audiences whose attention is difficult to capture and explain digital technologies, such as VR or FabLab. Overall, the team has embraced the videos and also suggests that the video collection be expanded. It notes that visitors who are passionate about glass have watched all of the videos on offer.

4.7 VR glass-blowing experience

4.7.1 Requirements

The procedure to define the use case scenario of this experience is the same as described in section 4.5.1. The use case scenario for the VR glass gathering experience was developed following the suggestion of Cerfav's apprentices who participated in the device's evaluation in 2024 in the framework of the educational experiments of the Education & Training pilot. It was decided that the VR experience can be used as a cultural mediation tool which addresses pupils or younger audiences, for example, by scheduling 'Wednesday VR afternoons'.

4.7.2 Implementation

The implementation of the VR glass gathering experience focused on the development of a single, clearly defined use case scenario rather than on the creation of a fully featured training system. The scenario was shaped following suggestions provided by Cerfav's apprentices, who participated in the evaluation of earlier VR devices in 2024 in the context of the Education & Training pilot. Their feedback highlighted the potential of VR not only as a professional training tool but also as a means of cultural mediation for younger audiences and first-time visitors.

Based on this input, it was decided that the VR experience should demonstrate one emblematic and visually compelling action of glassmaking: the gathering of molten glass from the furnace. This action was selected because it is central to glassmaking practice, difficult to observe closely in real conditions due to safety constraints, and immediately understandable by non-expert audiences. The experience was therefore conceived as an introductory and demonstrative VR application, suitable for short, guided sessions.

The implementation targeted use in educational and outreach contexts, such as scheduled "VR afternoons" for pupils or youth groups, where the application can support mediated discussion rather than autonomous skill acquisition. The VR application presents the gathering action from a first-person perspective, allowing users to observe the interaction between tools, molten glass, and the furnace environment in a safe and controlled manner.

4.7.3 Evaluation

Although the initial idea was to engage the general public and Cerfav's visitors with this experience, it was not possible to properly organise it due to logistical and human resources constraints. Therefore, the VR simulation was available for two days on 10 July and 9 September 2025 with pre-planned group visits. Craeft's Cerfav team organised the activity and adapted it to their audiences' needs and interests. The initial evaluation strategy included an anonymous survey (Annex J.4.1) for the first group (10 July 2025) and an interview (Annex J.4.2) with the second group (9 September 2025).

The first VR glassblowing experience was presented to a group of young Americans who were on a cultural exchange programme staying with French host families. The visit to the workshop gallery was made with the young people and their host families. They were able to visit the different areas of the Cerfav Workshop Gallery, including the exhibition space, glassblowing demonstration, shop, and the VR experience. This took place over the course of a morning. The VR simulator experience was contextualised, and we invited them to try it out. Only those young people who were interested took part (voluntarily). We then separated them into small groups of two or three people and let them try it out.

Figure 54. VR glass blowing experience with the first group of participants. Photo: Cerfav.

For the second group, we invited Cerfav's trainers to try out the glassblowing workshop simulator for themselves. The experiment lasted about an hour and a half to two hours. As with the group of young American tourists, we reviewed the context of the Craeft project and explained how the simulation works.

Figure 55. VR glass blowing experience with the second group of participants. Photo: Cerfav.

Due to the limited timeframe of the first group visit, a survey was not possible to take place. Instead, the participants provided anonymous informal feedback to the organisers (see questions in Annex J.4.1 - First group). More specifically, although the discussions were very brief, the overall feedback was very enthusiastic, with a gamified and fun approach to the simulator. With the second group, the trial was followed by a discussion to gather the trainers' initial impressions of this virtual experience and to explore with them the educational uses they could envisage for this digital tool. As the participants mentioned, VR is considered relevant for introductory training (reducing apprehension) and isolated practice of technical skills (such as removing glass from the furnace), but its limitations are clear: lack of haptic feedback (weight, viscosity of glass) and inability to replace hands-on experience. Therefore, they recommend targeted use, either before or in support of workshops.

4.8 Impact pathway

The Experiences dimension (Dimension 1 - D1) can be summarised as public-facing cultural and learning experiences delivered online, onsite, or in hybrid formats, including exhibitions, tours, VR, and demos. Their primary stakeholder groups are the general public, with a particular interest in craft enthusiasts, and craftspersons who wish to expand and disseminate their activities.

According to our analysis of Europeana's Impact Framework and use of the Playbook, below is a table showing how D1's use cases target specific strategic perspectives (impact types) and values.

Table 10. D1's impact pathway

Strategic Perspective	Value Lens	Use case
SP1 Socio-cultural	VL4 Learning	Mobile app 'Shine Bright Like Silver' 360 Tour 'Yecla is Wood: An Artisanal Heritage' Videos on glass technology

	VL5 Community	VR glass-gathering experience
		Videos on glass technology
		VR glass-gathering experience
	VL3 Legacy	Mobile app 'Shine Bright Like Silver'
		360 Tour 'Yecla is Wood: An Artisanal Heritage'
		Videos on glass technology
		VR glass-gathering experience
	VL1 Utility	Cultural Tourism Promotion DIY Platform
SP2 Economic	VL1 Utility	Mobile app 'Shine Bright Like Silver'
		Cultural Tourism Promotion DIY Platform

Evidence from the Experiences dimension indicates that D1 use cases primarily deliver learning-oriented and public-facing engagement value, with additional contribution through utility-oriented dissemination tools. The strongest quantitative evidence comes from the Shine Bright Like Silver museum application evaluation (n = 26 visitors) and from two utilisation-based software evaluations of the Cultural Tourism Promotion DIY Platform (independent replications in other regions). Together, these results support D1 as a coherent portfolio of lightweight experiences that (i) broaden access to craft knowledge, (ii) strengthen cultural connection and recommendation intent, and (iii) provide practical channels for disseminating local activities.

Under SP1 (Socio-cultural impact), VL4 (Learning) is supported by clear self-reported learning gains in the museum app: before the experience, most participants reported low knowledge of silversmithing, whereas after the visit and app use, the majority reported learning “somewhat” or “a lot”, and many expressed a desire to learn more and explore related craft locations. Qualitative feedback consistently highlights the value of interactive learning materials (e.g., memory game, interactive videos, ordering tasks) as mechanisms for engagement and knowledge retention, while also identifying practical refinements (e.g., clearer guidance, robustness against occasional technical malfunctions, and opportunities to add contextual archival material). Additional D1 experiences (tours, videos, and VR demonstrations) reinforce the same learning logic by translating craft processes into accessible formats for non-expert audiences, especially when physical access is constrained.

For VL3 (Legacy), the museum app shows strong recommendation intent: a large majority of participants indicated willingness to recommend the experience to friends and family, suggesting potential for repeat visitation and broader dissemination. VL5 (Community) is supported by the positioning of the experiences as shareable, public-facing resources that can be embedded in institutional or regional communication channels (e.g., online experiences, demonstrators, and media content), enabling collective visibility and ongoing public engagement beyond a single visit.

Under SP2 (Economic impact), D1 contributes chiefly through VL1 (Utility) and lightweight experience-economy indicators. The museum app evaluation shows mixed but generally positive signals regarding craft-related consumption intentions (e.g., neutral-to-moderate stated propensity to purchase craft products after the experience). More substantively, the Cultural Tourism Promotion DIY Platform

demonstrates utility as a dissemination instrument: the Crete deployment consolidated dispersed cultural offerings into a coherent digital interface, and independent replications (e.g., Rhodes and additional deployments in other contexts) verified that the architecture can be reused by new users to publish comparable platforms without modifying the underlying codebase. While longitudinal economic impacts (tourist behaviour change, practitioner revenue uplift) remain out of scope at this stage, D1's results support a scalable model for "introductory crafting" discovery that can be expanded through broader rollout and follow-up monitoring.

5 Games - Use Cases

5.1 Papier mâché sculpting workshop

5.1.1 Background & Related Work

Since the 1980s, arts and crafts have been integrated into special education curricula for their adaptability to students' individual needs [18]. Research underscores that art education serves as a transformative tool, fostering not only skill development but also a sense of belonging and empowerment in society [19]. Studies, such as Warmbolt's four-year research on visual arts education for children with impairments, reveal improvements in behaviour, communication, and learning. Behaviourally, students exhibit enhanced social interaction, creativity, and relaxation, as well as intangible benefits like increased self-esteem and independence [20]. A study at Cuza University further demonstrated that art interventions significantly reduce anxiety while boosting empathy and prosocial behaviour among children with impairments [21].

Art therapy has also proven effective in addressing the socio-emotional needs of children with neuro-psycho-motor deficits, enhancing self-esteem and social activity [22, 23]. For children with communication challenges, art therapy offers a holistic, non-verbal means of expression, supporting both expressive and receptive communicative skills [24]. Bingham et al. found that art education improves learning outcomes, including focus, following instructions, and sensory-motor skills, while also enriching knowledge in areas like literacy and numeracy [20]. However, despite these benefits, the role of crafts remains understudied, and there is a lack of standardised tools to assess their impact in special education contexts [20, 25]. This gap highlights the need for further research to fully understand and leverage the potential of arts and crafts in supporting students with special needs.

PIOP organises regular creative workshops for adults and children at the Conservation Lab, which is located at the organisation's Historical Archives building in Athens, Greece. Their focus is on making the audience familiar with the processes of the historical archive, such as paper conservation.

PIOP decided to use one of those prescribed workshops for Craeft's Valorisation pilot. The paper workshop focuses on the familiarisation of the public with the nature of paper. Participants learn about the history of the material, which began in ancient China, where the art of paper-making was invented. After an introduction, the participants dive into the process of manufacturing paper on their own by recycling used paper (newspapers, magazines, and so on). Furthermore, through another version of the workshop, they learn ways to transform the material into handmade objects with methods of creating artworks made out of papier mâché that they have made. Last but not least, the workshop promotes the recycling and reuse of materials for the creation of craftworks.

For Craeft, it was agreed to implement the version of sculpting with papier mâché because it resembles the process of pottery, which is one of the project's RCIs. Furthermore, an initial objective was to create digital instructions for Craeft's website. After PIOP's contact with a student from the Department of Social Work of the Democritus University of Thrace in Komotini, Greece, it was decided to implement and evaluate the papier mâché sculpting workshop at a special education setting. This decision was taken after consideration of the fact that PIOP regularly provides the workshop at their premises in Athens, but has

never implemented it for an audience with special needs. In this way, the digital instructions can address issues that will facilitate it with special audiences. The workshop was implemented in a controlled and specialised environment to better assess its value and results at Komotini's Special Kindergarten. This work was published on 29 July 2025 at the open-access Heritage Journal after peer review (Kaplanidi et al. 2025).

5.1.2 Evaluation plan & results

For the workshop's evaluation, a mixed-methods survey (Annex B.4) among the school professionals was conducted. The survey was anonymous and was divided into three sections. Part A regarded general information of the participants, including gender, age, and years of professional experience. Part B concerned the organisational part of the workshop. It consisted of three quantitative questions with five scales addressing the general organisation of the workshop, its adjustment to the children's needs, and the possibility of repeating it in the future. A yes or no question aimed to see if the employee had previously participated in a similar workshop. Finally, an open-ended question regarded future recommendations for improvements. Part C was intended to learn more about the school professionals' perception of the workshop's potential contribution in special education, and in this matter, at a kindergarten level. It included three quantitative questions with five scales addressing the children's participation, socialisation, and fine-motor skill development. An open-ended question at the end of the survey was targeted to learn if they observed any changes in their classroom in the following days after the workshop.

The workshop was held at the Special Kindergarten of Komotini, Greece, organised with the help of a team that included a former intern from the kindergarten. This prior connection, while raising potential concerns about research bias, proved valuable in accessing the field and fostering collaboration, especially given the unique setting and population involved.

All six children and nine professionals from the kindergarten participated in the workshop. The children had a range of impairments, including autism (three children with varying levels), intellectual retardation, Rett syndrome and tetraplegia due to premature birth. The professional team consisted of the headmistress (who is also a teacher), three special teachers, a psychologist, a speech therapist, an ergotherapist, a social worker, and a nurse. Six of these professionals took part in an evaluation survey, revealing a diverse group in terms of gender, age, and experience: four women and two men, with ages ranging from 20 to over 50, and professional experience spanning from 1 to over 10 years. The workshop followed the kindergarten's usual instructional model, with all children and professionals together in one classroom.

The research aimed to explore whether craft-based activities, specifically using papier mâché, could provide children with intellectual and motor impairments with new developmental opportunities in social interaction, manual skills, and learning. Observations revealed that the workshop encouraged multifaceted communication among professionals, organisers, and children. The classroom environment, designed to be inclusive and engaging, played a key role in fostering participation, resembling a mainstream kindergarten setting. The activity not only supported socio-emotional development but also allowed children to express themselves through verbal, physical, and visual cues, reinforcing the idea that crafting is a holistic process that enhances cognitive, emotional, and motor skills (Sumner 1968; Thorlindsson, Halldorsson, and Sigfusdottir 2018). Professionals noted improvements in children's engagement, socialisation, and fine-motor abilities, aligning with research that highlights the broader

benefits of art and craft activities in special education (Alyami 2009; Bingham, Hubbard, and Pennington 2012; Lavric and Soponaru 2023; Warmbrodt 2024).

Figure 56. Photos from the papier mâché sculpting workshop at Komotini's special kindergarten. Photos: Danae Kaplanidi / PIOP.

While the workshop was a one-time event with a small group, it offered valuable insights into the potential of craft activities in special education. Professionals, though new to such workshops, found the experience well-organised and beneficial, expressing interest in future participation. However, further research is needed to assess long-term impacts and scalability. It is suggested expanding assessments to other schools, incorporating control and test groups, and exploring how different impairments interact with craft materials and techniques. Additionally, the findings underscored the importance of inclusive environments and individualised attention in special education, while highlighting the need for more longitudinal studies to fully understand the developmental benefits of craft-based learning.

For Craeft, these findings translate into brief recommendations that cultural institutions or any other interested stakeholder wishing to conduct the workshop with a special audience could have in mind while preparing a visit to a special school or organisation. The materials, instructions, and recommendations (textual and visual) can be found in the Deliverable D4.3 "Toys and games for informal craft education ".

5.2 The Chess Project

In alignment with Craeft's mission, the chess demonstrator demonstrates how traditional forms can be reimagined through contemporary fabrication methods, producing outcomes that are educational, playful, and culturally resonant. It affirms that familiar cultural objects, when combined with experimental making processes, can generate technical insights and public engagement.

5.2.1 Requirements gathering and rationale

The selection of chess as a demonstrator within Craeft emerged through consulting with stakeholder Sibel Aksu Güngör. Dr Güngör holds an MBA in Art Management and a PhD in Anthropology, and her research focuses on the practice and culture of collecting. As a lecturer in Psychological and Cognitive Anthropology and the founder of PUHU Research and Consultancy, she brings expertise in the interplay between cognitive processes and social issues, as well as in curatorial and cultural innovation.

The activity was centred on exploring how diverse craft techniques could be channelled into the creation of chess sets. This framing served two purposes: to introduce traditional crafts to new audiences in a familiar form, and to demonstrate their adaptability to contemporary contexts. Through discussion and joint brainstorming, chess was identified as the optimal candidate.

Several considerations guided this decision. Universality was key: chess is recognised across cultures, ensuring accessibility and immediate familiarity. Its well-studied nature meant that Craeft did not need to enter into foundational research in game theory or test basic playability, allowing the focus to remain on craft techniques. Importantly, although originating in India, chess has deep roots in European history, linking naturally to contextualisation and historical narratives in European art and culture.

From a craft perspective, chess is uniquely versatile. Both the board and the pieces can be realised through practically all Representative Craft Interfaces (RCIs), either individually or in combination. Variations in material and technique allow for rich exploration. For example, different crafts can be applied to distinguish the colours of pieces, or to combine contrasting approaches within a single chessboard.

The co-creation session not only justified the choice of chess but also framed it as a flexible platform for demonstrating the project's central aim: to showcase the resilience and adaptability of traditional crafts when situated in a modern, globally recognised medium.

5.2.2 Guide to market

Chess is an effective carrier product for craft valorisation because it is inherently cross-material: the same recognisable set can be realised in wood, ceramics, stone, metal, textiles or leather, glass, composites, and even paper, allowing many craft traditions to participate without forcing a single production logic. It is also strongly giftable and collectable, with a high perceived value that lends itself naturally to premium positioning as an edition, a curated set, or a heritage object. In addition, chess is story-hungry: customers routinely expect meaning around origins, symbolism, craftsmanship, and the identity of an edition, which makes it unusually compatible with narrative-led marketing. Finally, it is standardised enough to preserve coherence across variants while still permitting strong stylistic differentiation. For practitioners, this

combination matters because they are not only acquiring a design; they are acquiring a dependable route to market.

To ensure that practitioners can reliably produce the chess sets, Pilot #3 should provide a coherent package of makeability assets tailored to each craft variant. These assets include concise process sheets that set out the key production steps with indicative time estimates, typical risks and defects to watch for, and recommended finishing approaches. They should be complemented by a bill of materials with sourcing guidance and by a practical quality checklist that standardises what “good” looks like across workshops. In parallel, the pilot should deliver a set of marketability assets that allow makers to present and sell the sets with confidence: a story kit with short, high-impact narratives linking the craft to chess history; a photography guide covering angles, lighting, 'hero shot' requirements, and scale cues; and a listing copy kit that provides ready-to-use product titles, three key differentiators, a ~150-word description, and keyword tags. Finally, packaging text and inserts should be provided alongside a pricing and margin worksheet that translates time and material costs into recommended retail price bands. If these components are delivered as a unified toolkit, practitioners can move from craft skill to a sellable product without needing to become marketing specialists.

A central rationale of the Pilot #3 approach is that the accompanying narratives must be designed as a reusable system, not improvised ad hoc. To remain scalable across multiple craft traditions, the “story kit” should follow a fixed template that can be instantiated for each craft variant with specific, verifiable content. In practice, this template can be applied consistently across a small card, a box insert, or an online product page: it begins with a one-line hook that is emotional and concrete, continues with a brief craft anchor describing what the craft contributes (for example, texture, sound, weight, tactility, or tradition), and then introduces a short chess-historical vignette (such as chess as a travelling idea, rule evolution, or the shift from courts to cafés). It should then point the reader to one or two observable design detail before closing with a short care-and-longevity note that reinforces value and trust. This structure makes the story feel “real” because it repeatedly returns to what the customer can physically see and touch, rather than relying on abstract claims.

Crucially, the narrative should not simply paste chess history onto craft. Each edition should establish a credible bridge between the craft and the game, using one dominant connection type appropriate to the material and practice. Some editions can align a material journey with chess’s historical journey across regions and cultures; others can link tool logic to chess logic by emphasising precision, patience, and iterative refinement (particularly persuasive for ceramics, metal, and wood). Further bridges can be built through parallels between social settings (courts and cafés versus workshops, guilds, or community practice) or through form and symbolism, where ornament, geometry, and pattern language naturally connect to weaving, carving, and inlay. Throughout, the language should remain grounded to avoid overclaiming while maintaining credibility.

Because Pilot #3 aims not only to support sales but also to motivate uptake of craft practice, the package should explicitly reduce risk for new or hesitant practitioners. This is achieved by providing a two-tier design for each craft: a Starter edition with fewer steps, more forgiving finishing requirements, and faster throughput, and a Master edition with richer surface work, a higher price ceiling, and collectable positioning. Risk is further reduced through pre-defined marketing assets so that makers are not forced to invent a sales strategy from scratch. Clear retail positioning (for example, “gift”, “heritage object”, “design collectable”, or “travel story”) and, optionally, a shared CRAEFT label also help practitioners “borrow trust” from a coherent pilot identity.

To scale across crafts without creating fragmentation, the product should follow a standardised architecture: pieces remain craft-specific, while the board can be either craft-specific or a shared "CRAEFT board" compatible with all editions; packaging should use a shared outer box for brand consistency paired with a craft-specific insert and story card. This modular architecture lowers barriers to entry by allowing small workshops to begin by producing only the pieces while sourcing boards and boxes from partner makers, and then expand their contribution over time.

Implementation should follow a simple, realistic pathway: select representative crafts and identify what each does best (e.g., carving, glaze, textile patterning, repoussé), define a shared design grammar (piece family silhouettes, proportions, base diameter rules), and co-design with practitioners so that manufacturability comes first rather than producing "designer fantasy" artefacts. Prototypes should be iterated for stability, handling, and finishing time, while story kits are written in parallel so that narratives reference actual, tested design details. The pilot then packages the result into a marketing pack (photos, copy, and pricing sheet), performs a small sales test (for example, via a pop-up, an Etsy-style test listing, or a partner museum shop), and refines based on concrete feedback: what customers asked, what broke, and what converted.

5.2.3 Market Survey

We then proceeded to make a market to predict the viability of chess sets as a product.

Chess stands as a unique intersection of ancient tradition and modern innovation, maintaining its status as both a revered strategy game and a dynamic cultural phenomenon. Its universal appeal spans ages, geographies, and social classes, evident in the millions of daily online matches, the global reach of international tournaments, and the enduring presence of physical chess sets in homes, schools, and cafés. The digital age has further amplified chess's popularity, with platforms like Chess.com and Lichess hosting tens of millions of games daily, democratising access and fostering diverse, global communities. The game's adaptability is also reflected in its embrace of streaming and esports, where events like PogChamps and popular series such as The Queen's Gambit have introduced chess to new audiences, blending elite competition with entertainment and spectacle.

Beyond the digital realm, chess thrives in traditional settings where it continues to serve as a social and educational tool. The market for chess sets, from budget-friendly plastic boards to luxury collector's items, mirrors this duality, with sales surging in response to cultural moments and seasonal trends. Technology, while transforming how chess is played and learned through AI and online platforms, has not diminished the value of physical sets, which remain cherished for their tactile and social qualities. This coexistence of digital and material engagement underscores chess's resilience and its ability to evolve while preserving its core identity, making it a compelling subject for both commercial innovation and craft experimentation.

The **complete market survey** is provided in Annex K.1

5.2.4 The materials

- Woodturning
- Glass mould

- Glass blow
- Clay
- Porcelain
- 3D printable
- Colouring

5.2.5 The stories

The developed **stories** and **proposals for their presentation** are provided in Annexes K.2 and K.3 respectively.

5.3 'Crafts' Board Game

5.3.1 Background & Related Work

Craft-related board games target: (i) gamification for cultural preservation, (ii) educational board games as learning environments, and (iii) the use of games to teach traditional crafts directly. Each strand provides precedents and gaps that motivate this work. The literature exemplified in the following sections highlights three key observations:

1. Gamification offers proven methods for motivating engagement with CH but often lacks tactile grounding.
2. Educational board games provide a social and embodied medium for learning, though they are underutilised in heritage contexts.
3. Existing work on games for crafts demonstrates feasibility but is fragmented and type-specific.

The 'Crafts' board game builds on the intersection of these strands. By embedding authentic craft processes into the mechanics of a board game and providing analogue and virtual implementations, it seeks to expand CH transmission, contributing to the scholarly conversation on gamification and learning, and offering an open-source tool for educators, researchers, and communities engaged in safeguarding ICH.

The literature review in Section 2.2 suggests that games can serve as translational devices, carrying tacit craft knowledge into contemporary contexts. To date, approaches remain either digital or narrowly targeted at specific heritage practices. This work differentiates by providing a generalised framework through which multiple crafts are represented, compared, and learned in an integrated system.

5.3.2 The game

The *Crafts* board game places players in the role of skilled artisans competing to gain wealth and reputation through the creation of crafted objects. Players collect raw materials such as sand, clay, wood, and marble, apply specialised tools and upgrades, and fulfil orders represented by Seller cards. Crafting involves a balance of strategy, skill, and chance, as dice-based checks determine success or failure, with unsuccessful attempts potentially resulting in damaged items that must be repaired or discarded.

The game's mechanics centre on several card types (Material, Tool, Upgrade, and Seller cards) which together simulate the crafting process and guide player decisions around resource management, risk mitigation, and efficiency. Each turn progresses through material gathering, crafting, and selling phases, with successful sales generating gold and victory points. Upgrade cards allow players to refine their techniques and improve crafting outcomes, reinforcing long-term strategic planning.

Designed as an original, open-source board game, *Crafts* integrates a market system, dice-based crafting checks, and educational themes inspired by traditional artisan practices. The game includes crafts such as glass blowing, clay and porcelain crafting, wood carving, and marble carving, drawing on resources from the Craeft Authoring Platform. By embedding real-world materials, tools, and techniques into its mechanics and vocabulary, the game aims to both immerse players in the experience of craftsmanship and foster an appreciation of traditional crafts. The game is freely available through GitHub and Steam's Tabletop Simulator, encouraging accessibility, experimentation, and community-driven development.

5.3.4 Evaluation

To evaluate the gameplay, a virtual playtest session was organised among three individuals and the researcher. Two participants had no prior knowledge of traditional crafts, and one had only limited familiarity. After the playtest, a mixed-methods survey (Annex B.6) in digital format (Google Forms) was shared among the participants. It consists of 11 quantitative questions using a scale of 5 to measure satisfaction rates and the participants' opinions regarding topics such as the gameplay, specific features, and rules. Three qualitative questions aim to capture what the participants liked the most and least about the game, as well as their thorough opinion regarding the cards' types.

Figure 57. Virtual playtesting photo. © Ioannis Stivaktakis

Participants provided overwhelmingly positive feedback after playing the game, with most ratings falling between 3 and 4 out of 5, indicating strong accessibility and enjoyment, particularly for those new to the theme. The thematic elements were especially well-received, with players praising how the game brought traditional crafts to life through its mechanics and diverse card interactions (materials, tools, and

upgrades) which added excitement and depth to each turn. The rules were also deemed clear, with players describing them as either 'clear enough' or 'perfectly clear,' confirming that the rulebook effectively supported a quick and smooth learning experience.

Areas for improvement were identified. Players noted that the second half of the game felt more restrictive, with fewer crafting strategies available, and expressed frustration with the heavy reliance on dice rolls. The reason is that it introduced an element of luck that sometimes overshadowed skill, particularly when crafting high-difficulty items. To address these concerns, potential refinements could include expanding late-game options, such as introducing mid-game abilities or rewards to mitigate luck, rebalancing certain cards for better fairness, and integrating QR codes more directly into gameplay to enhance immersion and strategic depth. These adjustments would help ensure a consistently engaging experience throughout the game.

Accessibility

A primary concern in educational game design is whether the rules are accessible to novices. All three participants stated that the rules were clear and easy to understand. Two described them as 'clear enough,' while one rated them as 'perfectly clear.' No significant difficulties were observed in learning the sequence of phases or the functions of the card types. This clarity is noteworthy, given the game's thematic specificity. Terms such as 'kaolin' or 'blowpipe' could have presented barriers, but the rules contextualised them sufficiently for play to proceed without confusion. This suggests that integrating authentic vocabulary does not compromise accessibility when adequate explanations are provided.

Thematic Engagement

Thematic integration is a defining feature of Crafts. Participants responded positively to this aspect: two rated thematic engagement highly, while one gave it the maximum score. Comments indicated that the link between cards, actions, and real-world practices was understood and appreciated. One participant observed that the diversity of card types, materials, tools, and upgrades added excitement and depth. Another noted that the act of 'risking' materials in dice rolls effectively conveyed the precariousness of artisanal work. These responses confirm that mechanics succeeded in embodying aspects of craftsmanship rather than serving as superficial decoration.

Engagement and Interest in Crafts

The most significant outcome was the reported change in participants' interest in crafts. Two players indicated that they were 'much more interested' in traditional crafts after playing, while the third reported no change. This suggests that the game serves as a stimulus for curiosity, even among players with no prior background. While the small sample precludes generalisation, the finding is consistent with broader arguments in the literature. Games act as gateways, encouraging exploration beyond the boundaries of play. Thus, Crafts fulfils its dual mandate of entertainment and education.

Educational Integration

The inclusion of QR codes is intended to enable learning. Feedback on this feature was mixed. Two participants rated the codes as highly useful, appreciating the opportunity to access additional information. The third rated them more modestly, suggesting that while valuable, the codes were not

essential to gameplay. This divergence highlights a design tension: educational features must be present without being intrusive. In the current implementation, QR codes serve as optional enrichments. Participants suggested that their value could be enhanced if integrated more directly into gameplay, for instance, by linking successful scanning to in-game bonuses. Such integration could encourage use without making learning feel compulsory.

Strategic Depth

The most critical feedback concerned the progression of play. Several participants felt that the second half of the game offered limited strategic options compared to the early stages. While the first half allowed flexibility in acquiring tools, upgrades, and materials, the late game was dominated by the pursuit of high-difficulty Seller Cards. This created a sense of restriction and reduced variation in strategy. Compounding this issue was the reliance on dice rolls for crafting high-value items. Despite meticulous preparation, participants voiced frustration over unsuccessful late-game attempts. Although risk is an inherent part of the design, an over-reliance on chance erodes the sense of control and mastery.

These critiques suggest two necessary adjustments: (i) the introduction of additional pathways to success in the late game, and (ii) rebalancing of probabilities to mitigate excessive frustration. Examples include mid-game abilities that guarantee minimum dice outcomes or alternative ways of accumulating reputation beyond Seller Cards. Participant feedback is consolidated in Table 11, which summarises strengths and challenges across categories.

Table 11. Consolidated feedback from three playtest participants, covering clarity, thematic engagement, educational impact, and perceived limitations.

Category	Positive Observations	Challenges Identified
Rule clarity	Easy to learn; no difficulties	none
Thematic engagement	Strong link between mechanics and crafts	none
Educational impact	Increased interest in crafts for 2-3 players	QR codes underused
Gameplay balance	Exciting early strategies	Restricted late-game; dice dependence

Refinement

Feedback revealed minor imbalances in specific cards. Some tools were perceived as disproportionately powerful, while others offered limited utility. Adjusting these values is routine in iterative design and addressed through further playtesting. More broadly, participants emphasised the importance of sustaining variety throughout the game. Expanding the pool of upgrades or diversifying Seller Cards could ensure that strategic possibilities remain open until the end of play.

Findings

The playtest confirmed several strengths of Crafts: a) Rules are clear and accessible, even to novices. b) Thematic integration is strong, with mechanics reflecting authentic artisanal processes. c) The game

stimulates interest in crafts, fulfilling its educational mandate. At the same time, areas for improvement were identified: a) Late-game strategies felt restricted, reducing replayability. b) Dice dependence introduced frustration, particularly in high-stakes crafting. c) QR codes, while valuable, require deeper integration into gameplay.

Implications

The findings illustrate the challenges of designing a game that is educational and engaging. For one, the game succeeds in representing key aspects of craftsmanship and motivating curiosity. On the other hand, it reveals the delicate balance required between skill and chance through optional learning features and mechanics.

In this respect, Crafts exemplifies a broader truth in the field of educational game design: a game must first succeed as a game before it succeeds as an educational tool. Players engage with the rules and mechanics for enjoyment, with the educational value realised only if play remains compelling. The evaluation, therefore, provides a roadmap for refinement, ensuring that the game sustains both functions without compromise.

5.4 Impact pathway

The Games dimension (Dimension 2 - D2) can be summarised as playful, goal-oriented interactions for learning and craft engagement. They include thematic workshops, mini-games, serious games, and challenges. Their primary stakeholder groups are educators and the general audience. According to our analysis of Europeana's Impact Framework and use of the Playbook, below is a table showing how D2's use cases target specific strategic perspectives (impact types) and values.

Table 12. D2's impact pathway

Strategic Perspective	Values Lenses	Use case
SP1 Socio-cultural	VL4 Learning	Papier mâché sculpting workshop
		The Chess Project
		'Crafts' Board Game
	VL3 Legacy	The Chess Project
	VL1 Utility	Papier mâché sculpting workshop
		The Chess Project

In summary, the use cases of this dimension have brought together the insights and feedback of six children and 14 adults, mainly from Greece. The adult background differs and relates to the use cases.

Through the evaluation results of D2's use cases, it can be said that they have highlighted the ability and importance of learning through craft and play, some use cases provided further insights and results regarding their improvement, and while all of them contribute in one way or another to the continuation of the contact of people with crafts, one has especially bridged the concept of legacy by combining two historical games.

More precisely, the papier mâché workshop served as a holistic learning experience, fostering communication, creativity, and skill development. Children engaged in multimodal expression (verbal, physical, and visual) while professionals observed improvements in socio-emotional skills, socialisation, and fine-motor abilities. The inclusive environment encouraged participation and highlighted how craft activities can support cognitive, emotional, and motor skill development in special education. The workshop also provided professionals with practical insights into the benefits of craft-based learning, though further research is needed to explore long-term impacts and scalability.

The Chess Project emphasised experimental and iterative learning. Participants learned through trial and error, turning early failures into practical decisions (e.g., melting materials slowly, oiling moulds, and using alcohol to remove bubbles). This process not only improved technical skills but also encouraged problem-solving and adaptability. The participants further extended their learning by repurposing moulds for creative play, demonstrating how structured tasks can inspire open-ended exploration. The project showcased the potential of 3D-printed moulds as a bridge between digital design and hands-on craft, making learning accessible and engaging for home and informal educational settings.

The board game offered a thematic and interactive learning experience, bringing traditional crafts to life through gameplay. Players engaged with cards representing materials, tools, and upgrades, which added depth and excitement to each turn. The game's mechanics encouraged strategic thinking, creativity, and collaboration, while its focus on traditional crafts provided an immersive way to learn about materials, techniques, and cultural heritage. The game's design made learning fun and engaging, appealing to a wide range of players.

Further findings highlight practical and user-centred utility features for both the papier mâché sculpting workshop and The Chess Project. For the workshop, the recommendations focus on making the experience accessible and adaptable for special audiences, such as those in special schools or organisations, by offering clear guidance for cultural institutions or stakeholders preparing visits. In The Chess Project, the process is designed to be user-friendly, requiring ordinary kitchen tools while relying on a few critical procedural steps to ensure success. A key insight is the importance of mould design: while two-part moulds suffice for simpler shapes, four-part moulds significantly improve reliability for complex geometries, such as chess pieces with undercuts. This transition to four-part moulds enhances usability without adding complexity, making the process more robust and accessible to non-experts. Overall, both initiatives emphasise low barriers to entry, scalability for various skill levels, and the empowerment of users to create tangible artefacts from digital designs.

Last, The Chess Project, from its design, is a use case that combines an old, established, and well-known game, existing in physical and digital formats, with traditional craftsmanship. This activity perpetuates the socio-cultural value of its components and offers a fun way to make a game set from scratch, experiment with craftsmanship, and continue the legacy of a traditional game.

6 Retail Support - Use Case

Labelling in the traditional crafts sector serves more than product identification; it ensures authenticity, provenance, and protection against counterfeiting and cultural appropriation. By providing verifiable information about a product's origin, materials, and crafting processes, effective labelling builds consumer trust, distinguishes genuine handcrafted goods from mass-produced imitations, and supports fair compensation for artisans. It also helps preserve cultural identity and traditional knowledge, recognising the economic and cultural value embedded in these crafts. However, traditional intellectual property (IP) frameworks often fall short in protecting Traditional Cultural Intellectual Property (TCIP), as they prioritise individual authorship and commercialisation, which clash with the communal, intergenerational nature of many crafts.

To address these gaps, innovative approaches such as Geographical Indications (GIs), community-based IP management, and blockchain technology are being adopted. GIs protect products tied to specific regions, ensuring quality and reputation, while blockchain and NFTs provide tamper-proof records of provenance and ownership, combating counterfeiting and enabling fair benefit-sharing. Initiatives like TK Labels allow Indigenous and artisan communities to define the terms of engagement with their cultural heritage, ensuring respect for traditional governance and preventing misappropriation. Yet, challenges remain, including the cost and accessibility of digital tools, resistance from traditional institutions, and the need for user-friendly, scalable systems that respect cultural protocols.

Looking ahead, future labelling strategies should focus on harmonising diverse legal frameworks and expanding the use of advanced technologies like blockchain, QR codes, and NFC tags to enhance transparency and consumer trust. Public awareness campaigns and support programs can empower artisans with knowledge of IP rights and digital tools, ensuring they retain greater value from their work. By combining technological innovation with community-centric models, labelling can protect both the cultural integrity and market viability of traditional crafts, fostering sustainable livelihoods and preserving heritage for future generations.

6.1 Background

6.1.1 Biographical Objects and Economics

To formulate the content of the online form, literature research was conducted in cultural anthropology, economics, and informatics. The concept of 'biographical objects' is relevant to material culture studies; it refers to the cultural perspective of analysing objects throughout their lifetime. An object biography can reveal aspects of individual and collective identity, uses, experiences, and relationships forged over time. In contrast to economics, an object biography aims to reveal hidden aspects of an object's development that refer more to transmission than productivity and commodification [34, 38].

In the field of economics, there has been a shift towards 'servitisation,' which focuses on offering services rather than just products [30]. These services aim to complement the physical product. While a product biography includes design, production, circulation, and use, an additional service adds another product life cycle [31]. However, in today's globalised world, the consumption of such services might be more expensive than buying a new product because they usually constitute labour-intensive work [33].

6.1.2 Sustainability and Consumption Patterns

Living in the Anthropocene, recognising the connection between human activity and environmental impact is vital. A circular economy supports the maintenance, reuse, and recycling of products. Whereas a classic product biography is a linear process, a circular product biography includes loops of use. Moreover, consumption habits and intentions are activities that further impact our lives [28, 29]. Although improving the technological efficiency of products makes environmental sense, it is not sufficient to combat the scale of the problems we face [33].

Special attention must be paid to consumption levels. Research into consumer intention based on bio-based certification shows that making certification visible is a good management practice to communicate a product's background; however, prices must also become more elastic to encourage consumers to adopt sustainable habits [32]. Furthermore, purchase intention relies on direct product information because it influences the perceived price and quality of a product [37].

6.1.3 Technological Implementation

Craeft's new online form proposes a combination of these biographical approaches, taking into account consumer habits. It suggests a culturally informed craft product biography that enhances the information provided to consumers. While craft products are esteemed for their uniqueness and environmentally friendly practices, new business models are being researched to compete with global industrial production (such as the European-funded project HEPHAESTUS).

Technologically, the form's layout draws from the Product Biography Information System (PBIS), which generates a holistic biography by gathering data from raw materials to the end product, as well as third-party data after the product leaves industrial facilities [39]. Furthermore, it incorporates suggestions on influential words and categories discovered through AI-driven product description mining of online stores [36, 71]. The narrative generation is affected through AI tools such as ChatGPT and Gemini. Recently, partners have investigated the possibility of integrating large language models (LLMs) into workflows using semantic web technologies to generate narratives, a feature to be further explored in the future [27].

6.2 Requirements

The goal is to create a content collection form that will help to digitally contextualise craft products and provide the possibility to present them through varying channels to enhance their marketing opportunities. During the plenary meeting in Paris in October 2024, it was agreed to create an online form where text, images, video, sound, and other media can be included. In summary, once the content is uploaded in the form, the result will be an online narrative for the object that would be generated by scanning the object or a QR code with a mobile camera. The craftsperson will have choices on how the resulting narrative will look, i.e. as a text narrative with media (third-person narrative), as a biographical object (first-person narrative), or as a podcast (sound narrative; inclusive for visually impaired people), or a combination of the above. The narratives are AI-generated.

To formulate the content of the online form, literature research in the fields of cultural anthropology, economics, and informatics took place to find out what kind of information is reviewed in Section 2.3. The

concept of biographical objects is relevant to material culture studies and refers to the cultural perspective of seeing and analysing objects and their lifetime, from making to so on. An object biography can reveal aspects of individual and collective identity, uses, experiences, and relationships that are forged throughout an object's lifetime. Furthermore, the same object or type of object can constitute different roles in the hands of different people, such as being a gift for one or a tool for another.

6.3 Implementation

To prepare the development and implementation of the digital contextualisation marketing tool for craft products, first, we developed the content collection form (Annex H3.3), and then, we identified the interested parties to collaborate in the data collection before the technological development. After gathering the content, technological development took place. Registering the data in the knowledge base that will serve the results requires training images so that the products are visually recognised. The process begins by uploading a dataset where each folder corresponds to a specific item. Each folder contains multiple images of the item, taken from different angles and under varying lighting conditions. The visual recognition system extracts its visual features. These features are used to compare input images with the saved embeddings to visually recognise items from user photographs.

A craft object is photographed under varied angles and lighting conditions to capture its visual variability. These images are organised into class-specific folders, creating a structured dataset. Pre-trained models generate embeddings for each image, which are then stored in a database. When a user captures or uploads a new image, the system processes it through the same embedding model, and similarity scores are calculated to determine the closest match. The UI has been designed to be simple and accessible from mobile devices to cater to the needs of workshop practitioners. The figure below illustrates this UI.

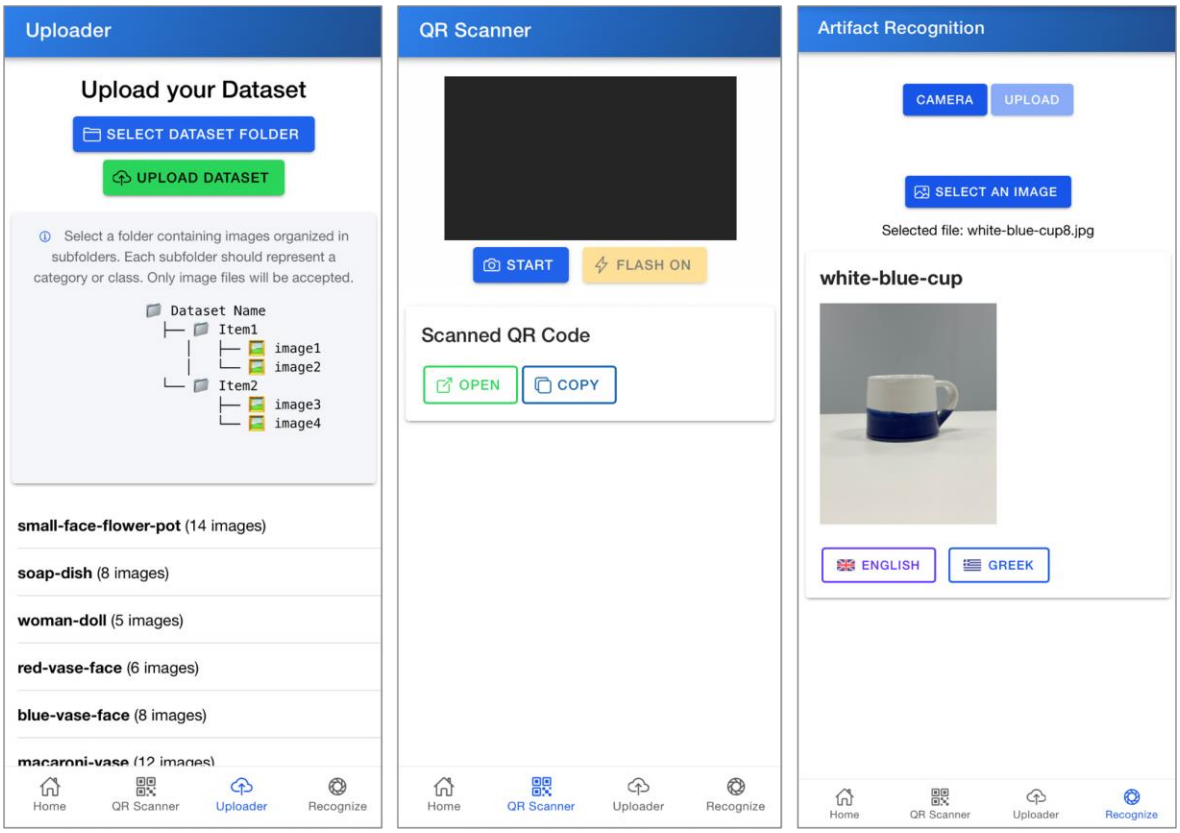


Figure 58. The UI of the application for creating datasets.

The recognition system is elaborated in [DX.X]. We describe here its marketing integration. Once recognition has been achieved, the system does not stop at identification. Instead, it activates links to craft product catalogues, authenticity certificates, and potential e-commerce channels. For example, recognising a ceramic cup in an exhibition leads the user to a digital page containing its historical background, a video of its making, and links to contemporary artisans producing similar items. Recognition thus functions as an entry point to valorisation, connecting computational results with cultural and economic outcomes. An example schema is provided in the table below.

Table 13. Schema example

Field	Description	Example
ID	Unique identifier	CER2025_001
Name	Common name or title of the artefact	Hand-thrown ceramic cup
Maker	Artisan or workshop responsible	Maria Papadaki
Technique	Craft technique used	Wheel-thrown, glazed
Material	Primary material(s) used	Stoneware clay, lead glaze
Origin	Geographic origin of the artefact	Crete, Greece

Period	Historical period or date	Contemporary (2025)
Narrative	Brief description linking to the story	Made using traditional Cretan techniques for export markets

Thus, dataset preparation is not only a technical task but also a curatorial one. To ensure meaningful contextualisation, datasets must be annotated with metadata such as maker, location, period, and technique. This transforms the system from a mere recognition engine into a cultural mediator, capable of linking the identified object to narratives of production, tradition, and use. Equally important are the user facilities, which determine whether technical capacity translates into practical adoption. The application incorporates an intuitive interface that provides clear entry points for image recognition, QR fallback, and dataset management.

6.3.1 Ceramics

Ceramics are mainly represented by the Cretan ceramics case at Keramion in CRAEFT, a traditional yet very active pottery workshop in the village of Margarites, Rethymno, Crete. This collaboration represents the family of Cretan storage and domestic wares, from biscuit and glazed tableware to monumental storage jars, produced with traditional clay preparation, wheel-throwing, burnishing and wood-kiln firing.

In addition, we collaborated with Koumoulia, a ceramics workshop, teaching studio, online shop, and small guesthouse based near Petrokefalo, about 16 km from Heraklion in Crete. The workshop started in 2005 and has since focused on both making and teaching ceramics. This maker has an e-shop with modern ceramics, including several hundred pieces. Besides functional ware, its products include decorative work, jewellery, bowls for pets, and playful clay objects.

The Keramion ceramics dataset is relatively simple, comprising a total of 63 images distributed across 6 distinct item classes. Each class contains 10 images, except for the 'white-blue-cup' class, which includes 13 images. The Koumoulia dataset includes a total of 271 images across 16 distinct item classes, with each class containing between 9 and 26 images. Indicative images of the items are shown in the figure below.

Figure 59. Ceramics dataset

6.3.2 Glassware

During the requirements workshop for the glass experiences, which was conducted in Paris in October 2024 during the project plenary meeting, Cerfav acknowledged that, as desired (direct) outcomes of their pilot activities, to offer more information to their visitors and 'nudge' their curiosity about glass making. Through further discussions with FORTH and the Atelier-Galerie team of Cerfav, it was decided to use the Retail use case for glass products that are on display for sale at Cerfav's shop. Cerfav had internal meetings and collected the content needed to develop each product's webpage. Below is a table with Cerfav's glass products and their respective webpages in French and English.

Table 14. Glass products.

	*Gérard* Product webpage Gerard_FR Gerard_EN Photo: Cerfav

Marianne of Diversity / Marianne de la Diversité

Product webpage

Marianne_FR

Marianne_EN

Photo: Cerfav

Mirabelle

Product webpage

Mirabelle_FR

Mirabelle_EN

Photo: Cerfav

Paperweight / Presse-papier

Product webpage

Paperweights_FR

Paperweights_EN

Photo: Cerfav

Saint Nicolas Confectionery / Saint Nicolas Confiserie

Product webpage

Saint Nicolas Confectionery_FR

Saint Nicolas Confectionery_EN

Photo: Cerfav

Saint Nicolas Madeleine

Product webpage
Saint Nicolas Madeleine_FR
Saint Nicolas Madeleine_EN

Photo: Cerfav

Saint Nicolas Origin

Product webpage
Saint Nicolas Origin_FR
Saint Nicolas Origin_EN

Photo: Cerfav

Pumpkin / Citrouille

Product webpage
Pumpkin_FR
Pumpkin_EN

Photo: Cerfav

6.3.3 Silverware

PIOP came in contact with the silversmith Achilleas Georgiadis, whose workshop and store are based on the island of Tinos, Greece. Mr Achilleas Georgiadis has been collaborating with PIOP for the past three years. He has studied ceramic technology and worked on the design of ceramic objects. In 1996, he created his jewellery design workshop. The materials he is using are metal and marble, among others. On behalf of PIOP, he has exclusively created a series of seventeen different pieces of jewellery inspired by the collections of PIOP's museum network, such as the Museum of Marble Crafts, the Silversmithing Museum, the Open-air Water Power Museum and the Silk Museum.

PIOP visited Mr Georgiadis at his shop and workshop in Tinos, Greece, in May 2025. For the implementation and evaluation of CRAEFT's digital contextualisation marketing tool, he decided to show us a series of silver jewellery called 'Curly'. This series is part of his older work that he likes to revisit. The

series is defined by the curly structure of the silver, flattened wire, which Mr Georgiadis sees as a modern development of the traditional silversmithing filigree technique, originating from Ioannina. A distinctive feature of the series is that through its structure, oxidation and polishing, the craftsman accomplishes a combination of light and darkness that is unique.

To create the narrative story of the 'Curly' series, we asked Mr Georgiadis to fill out the content collection form. For the description of the making process, we also recorded an ego-centric video of him producing the main part of the piece of jewellery to add it to the narrative. When the narrative stories were created by FORTH in collaboration with PIOP, PIOP checked with Mr Georgiadis the texts and visual content. The narrative webpage was developed in English and Greek, and can be found below.

Table 15. Silver products.

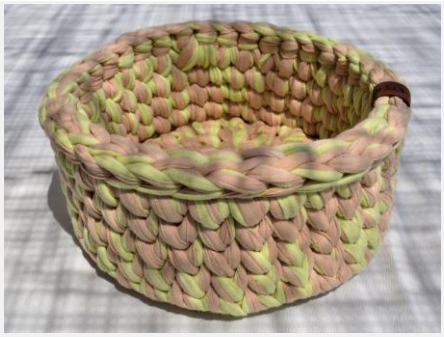
 	Ring (top) and Necklace (bottom) from the 'Curly' series. Product webpage Curly_GR Curly_EN Photo: © Danae Kaplanidi / PIOP

6.3.4 Woven products

PIOP contacted the social cooperative enterprise 'To Pleteno', which is based in Xanthi, Greece. Pleteno is a creative group of women from the mountain villages of Thrace, a region with a rich cultural heritage and a diverse Muslim population. In 2019, they founded Pleteno, which is dedicated to crafting handmade women's accessories and home décor items. Pleteno means 'knitted' in their local language. They not only develop new skills but also challenge and change the stereotypes surrounding the role of women in their communities. They are also passionate about the circular economy and transforming industrial fabric waste into beautiful products through reuse and recycling.

For the Valorisation pilot and testing Craeft's digital contextualisation marketing tool, PIOP visited Pleteno to gather content and visual material. After discussions with the women, the following products were selected, presented in the table below. We tried to represent most of the women through their creations to better illustrate their experience and crafting methods. The webpages were produced in English and Greek.

Table 16. Pleteno's textile products.

	*Basket* Craftswoman: Emine Product webpage PL4_GR PL4_EN Photo: © Danae Kaplanidi / PIOP
	*Basket* Craftswoman: Fatme Product webpage PL1_GR PL1_EN Photo: © Danae Kaplanidi / PIOP
	*Basket* Craftswoman: Fatme Product webpage PL2_GR.html PL2_EN.html Photo: © Danae Kaplanidi / PIOP

Necklace

Craftswoman: Gülşen

Product webpage
PL3_GR
PL3_ENl

Photo: © Danae Kaplanidi / PIOP

Click-clack bag

Craftswoman: Bedia

Product webpage
PL8_GR
PL8_EN

Photo: © Danae Kaplanidi / PIOP

Click-clack bag

Craftswomen: Bediha, Meryem

Product webpage
PL6_GR
PL6_EN

Photo: © Danae Kaplanidi / PIOP

Click-clack bag

Craftswomen: Bediha, Meryem

Product webpage
PL7_GR
PL7_EN

Photo: © Danae Kaplanidi / PIOP

Carpet

Craftswoman: Bediha

Product webpage

PL5_GR

PL5_EN

Photo: © Danae Kaplanidi / PIOP

Further to Pleteno's textile products, we also used a dataset of woven objects, created on a loom, and made of many threads woven in a warp and a weft, which is housed in the Human-Computer Interaction (HCI) Lab at FORTH. These items depict images and shapes in great detail and with different colours. It includes a total of 161 images distributed across 4 distinct item classes. Each class contains an average of 40 images. The object classes are:

- red-cape (33 images)
- orange-green-pink (38 images)
- green-flower-red bg (46 images)
- pink-black (44 images)

We acquired photos of 4 different textiles. All were photographed under various conditions, lighting, and shots. For artificial light and darkness, the shots were taken in a simulation room, while the shots with natural light were taken in the meeting room. A total of 161 photos, ~40 photos per object.

Figure 60. Woven objects dataset.

6.4 Evaluation plan & results

6.4.1 Technological evaluation & results

We present the results of our system in identifying objects within our datasets. To evaluate the accuracy of the different neural networks that we use, we utilise quantitative performance metrics. These metrics allow us to assess the effectiveness of the models and to determine which objects are most accurately recognised.

The evaluation utilised test objects primarily sourced from the Mug & Cup Dataset, supplemented by three ceramic items. Each object was photographed against a standard white background. The technical evaluation can be found in Annex H.1.

Corresponding web pages and QR codes, available in both Greek and English, were created to support the evaluation process.

The mobile application was deployed on a virtual machine and served via an NGINX web server. For public accessibility, a subdomain, app.craeft.eu, was configured under craeft.eu and secured with an SSL certificate.

Participants were tasked with evaluating the application by engaging with its core features: direct object scanning, image and dataset uploading, and, for misclassifications, scanning QR codes to obtain correct results. The evaluation focused on both the application's functionalities and the user experience.

The evaluation process was structured around a single scenario, divided into three segments. Upon completion, participants provided feedback anonymously on their overall experience using the System Usability Scale (SUS) questionnaire (Annex B.6), and also answered questions about the time spent interacting with the application and detailed feedback across seven key questions regarding the system (Annex J.5).

Figure 61. QR codes for Evaluation

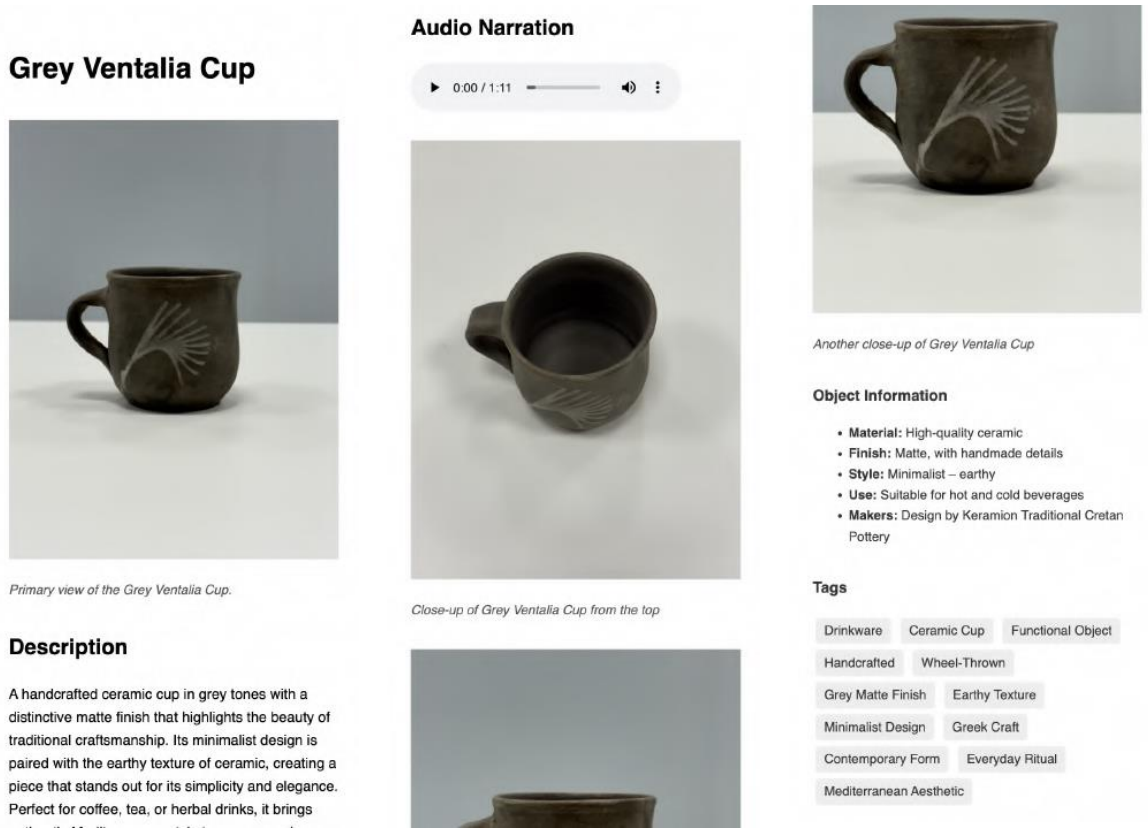


Figure 62. Item page example

Each participant was provided with a personalised 'Evaluation Table', specifically designed to document key metrics during the evaluation session. This table comprehensively captures the evaluation's start and end times, alongside demographic data such as gender. Furthermore, it records the user's previous exposure to comparable systems, which is used to categorise their expertise level as either 'Moderate' or 'Advanced/Expert.' The table also serves as a log for the frequency of help requests made by the user and the total number of errors committed throughout the evaluation. The tables are provided in Annex H.3.

Qualitative results

The overall tone of the responses was positive, highlighting the system's effectiveness, simplicity, and potential utility. More precisely, the participants generally found the system to be simple, usable, and effective. Key positive aspects included:

- Practicality: Quick recognition and the QR scanner feature were specifically mentioned.
- Accessibility: Noted as being useful for 'every age group.'
- Contextual Value: Described as 'cool' and 'useful for more information' in an exhibition setting.

Most participants expressed a willingness to use the system, primarily in specific, context-appropriate scenarios:

- Specific Contexts: Use in 'exhibitions and similar venues' or environments where recognition features are needed.
- Limitations: Some participants noted it would not be for an 'everyday basis' or directly related to their work, but acknowledged its usefulness 'in the right context.'

The most appreciated aspects of the system are centred on performance and user control:

- Performance: Quick and reliable recognition was the most frequently cited positive, providing 'certainty for every movement' and 'fast recognition times.'
- Usability/Control: Participants liked the system's simplicity and the ability to 'enter your own information and your datasets' (e.g., the 'Upload Dataset' feature).
- Overall Quality: The system presented an 'overall really good image' and offered 'more ways to recognise items.'

Minor issues and suggestions for improvement were consistently focused on the user interface and experience:

Table 17. Minor issues and suggestions for improvement

Issue/Suggestion	Reported Difficulties (Q3)	Suggested Changes (Q5)
Navigation & Layout	Bottom bar 'needs to be more distinct' and needs a clearer indication of the selected tab.	Better button organisation (e.g., side-by-side like in 'Upload Dataset'). More distinct bottom bar.
Visual Appeal		A more attractive interface.
Feedback/Clarity	The 'waiting on 'Upload Dataset' was an issue.	The image taken or uploaded should appear. More information/guidance on what can be done in each tab.
Camera Access		Selecting the camera option should open it directly.

Participants suggested features that would expand the system's functionality and convenience:

- Data Management: Ability to upload multiple datasets and the option to create a dataset directly within the application.
- History/Tracking: A small recognition history feature.
- Integration: Integration with the smartphone’s camera.
- Presentation/Detail: 3D models with rotation and bullet points on item pages.

All participants replied negatively when asked if they had anything further to add, suggesting their previous answers covered their main points.

In conclusion, participants generally evaluated the system as simple, usable, and effective, particularly valuing its quick, accurate recognition and the 'Upload Dataset' feature. They indicated a high likelihood

of using it in appropriate contexts, such as exhibitions. Reported difficulties were minor and largely related to the interface, including button organisation, clarity of the bottom navigation bar, and waiting times during dataset uploads. Suggested improvements included a more attractive interface, better visual feedback when handling images, and clearer in-tab guidance. Proposed new features focused on expanded data management (multiple dataset uploads, in-app dataset creation) and enhanced interactivity (recognition history, camera integration, 3D models). The overall feedback was highly positive, affirming the system's potential while providing clear directions for usability and feature enhancements.

6.4.2 Customer evaluation & results

To further evaluate the tool from the perspective of the customers, an impact measurement plan was drafted to help us identify the desired outcomes of the tool's use. Through its conceptualisation, the tool design targets the personalisation of product information, the support of the circular economy, and the enhancement of object and human relationships. It is believed that by offering such information through a unified and accessible narrative, the product's value will be increased. The strategic perspective is mainly economic, but it also focuses on environmental and social aspects. The desired short-term outcomes, that is, those that reflect the user's perspective directly after the tool's use, are to offer more information about the product through an innovative and inclusive way and convince the customer to make the purchase. Long-term outcomes are more abstract and less directly measured. Nevertheless, the tool intends to also enhance human and object relationships and promote multiple object lives through circular economy principles.

To measure and evaluate the tool, a survey was developed based on the above-mentioned desired outcomes (see Annex B.3). Two questions target the learning outcomes of the experience, two questions reflect utility aspects of the tool, one question regards the perception of human-object relationships, another the intention to follow the circular economy recommendations, and two questions concern the overall satisfaction and the intention to recommend it to a friend or family member. An open question at the end of the survey seeks further comments and/or suggestions. Demographic data are also asked for a general overview of the participants' country of origin and age. The survey was intentionally designed to be short so as not to tire the participants. To maximise the accuracy of the answers, all questions used a scale from 1 to 10 to have a greater variety of responses and perceptions. The survey was developed in digital format in Google Forms and was accessible through the narrative page of each product. Available languages include English, Greek, and French. Further to the survey, Cerfav, one of the project partners that implemented the use case at their premises, conducted an interview (Annex J.3) with the Atelier-Galerie team of their institution to collect their feedback and view of adopting such a tool in their activities.

The evaluation started in July and ended in December 2025. Once we prepared the products' webpages in QR codes, we shared those with our collaborators, Achilleas Georgiadis in Tinos, Pleteno in Xanthi, and Cerfav in France. For Cerfav, the Atelier-Galerie team installed communication material in their shop. Furthermore, they contacted the Nancy tourism office, and it was agreed to install more related material at their premises to further enhance the evaluation efforts.

Figure 63. Cerfav's communication material.

Figure 64. Installation at Cerfav. Photo: Cerfav.

Figure 65. Installation at Nancy's tourism office. Photo: Cerfav.

In addition to the physical efforts, we also launched an online communication campaign by introducing the pilot activity on Craeft's website and disseminating the effort through social media channels, such as Instagram and LinkedIn. Craeft's communication project partner, Mad'in Europe, prepared the visual identity of the posts and shared the content.

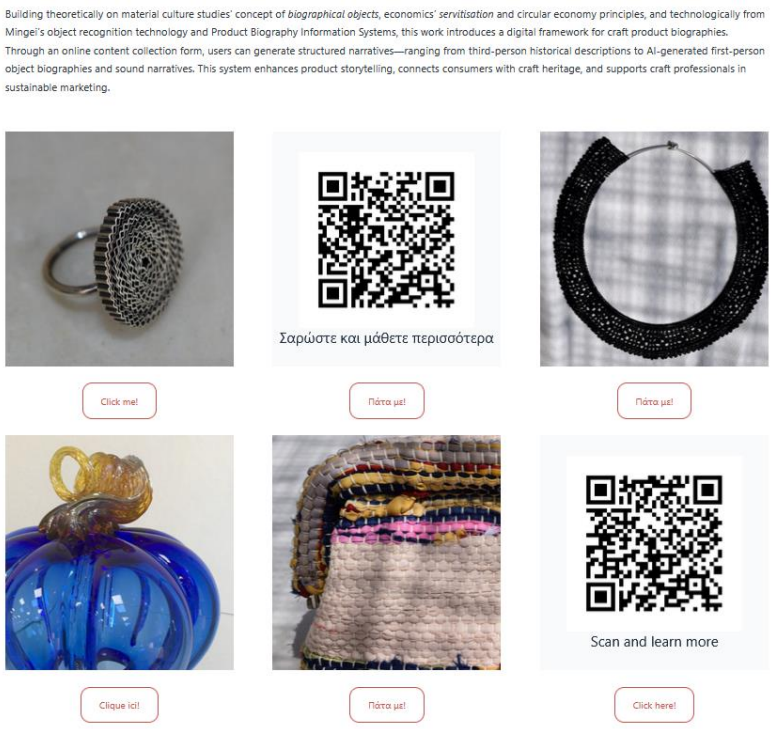


Figure 66. Screenshot from Craeft's website.

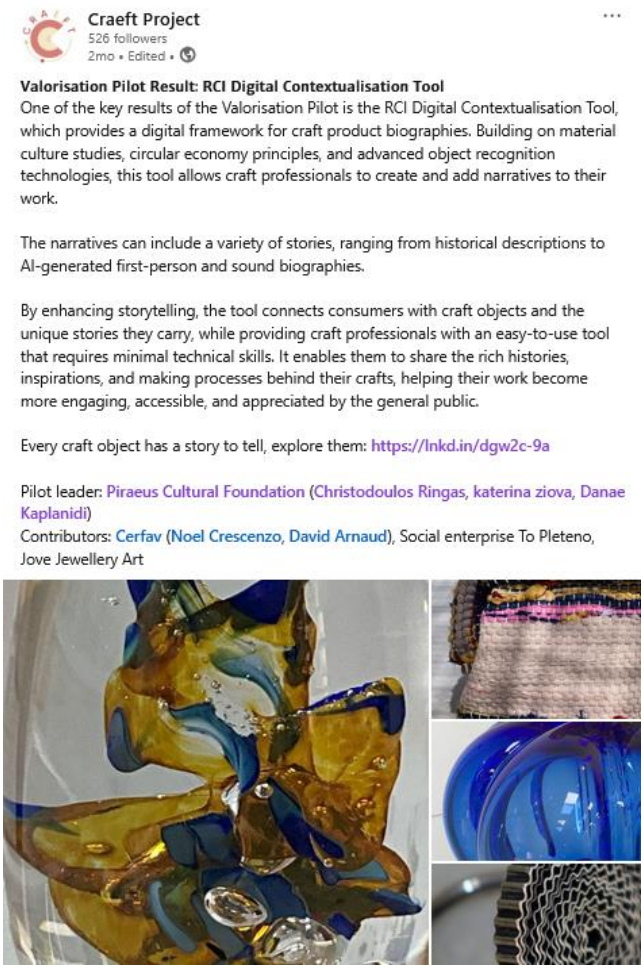


Figure 67. Screenshot of LinkedIn's post.

Figure 68. Communication material for Instagram posts. Photos: Mad'in Europe.

Although the evaluation lasted five months, the participation results are not satisfying, with only 14 people answering the online evaluation form. This appears to be due to several parameters. First, it was not feasible for PIOP to support physical evaluation at the collaborators' premises in Tinos and Xanthi due to limited resources, time, and health issues. Through communication with the collaborators in Tinos and Xanthi, it was clear that it proved difficult for them to promote the use of the QR code and urge customers to fill in the survey, either because they were short-staffed during high season or because they were closed for summer vacations. Cerfav launched the evaluation for a shorter period, until October, and encountered operational constraints both at their shop in Vannes-le-Châtel and the Nancy tourism office. As they mention, the motivation of customers to fill out surveys was low. Customers were informed and encouraged to test the digital tool and complete the surveys, but the main concern of the Atelier-Galerie team was to maintain good relationships with customers, without forcing them to experiment or fill out surveys.

Regarding the online evaluation efforts, it was proved more difficult than expected to reach out to a general audience. It seems that although the LinkedIn post had 11 likes and three reposts, the Instagram posts gathered a total of 69 likes.

It can be said that after this experience, it was made clear that targeted physical evaluations by direct project partners are more profitable than asking for further cooperation with colleagues or external collaborators. Online evaluation proved even more difficult to conduct despite the long period. These limitations and possible adjustments are taken into account for future research.

Analysing the result with the limited sample of 14 participants, it should be mentioned that they do not qualify for generalisations but rather for indications worth or not to be further researched and developed. Regarding the demographics of the sample, half of the participants were from Greece, while 22% and 21% were from France and Spain, respectively. Furthermore, 7% were from Italy. The participants' ages ranged equally, with 36% between 35 and 44 years old, and 45 and 54 years old. 14% were 55 to 64 years old, while 7% were between 25 and 34 years old, and another 7% were between 65 and 74 years old. The figures below show the sample's demographic information in detail.

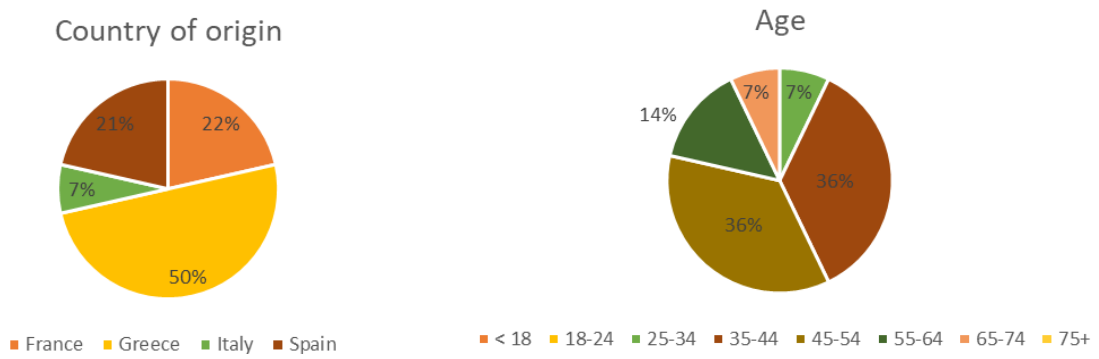


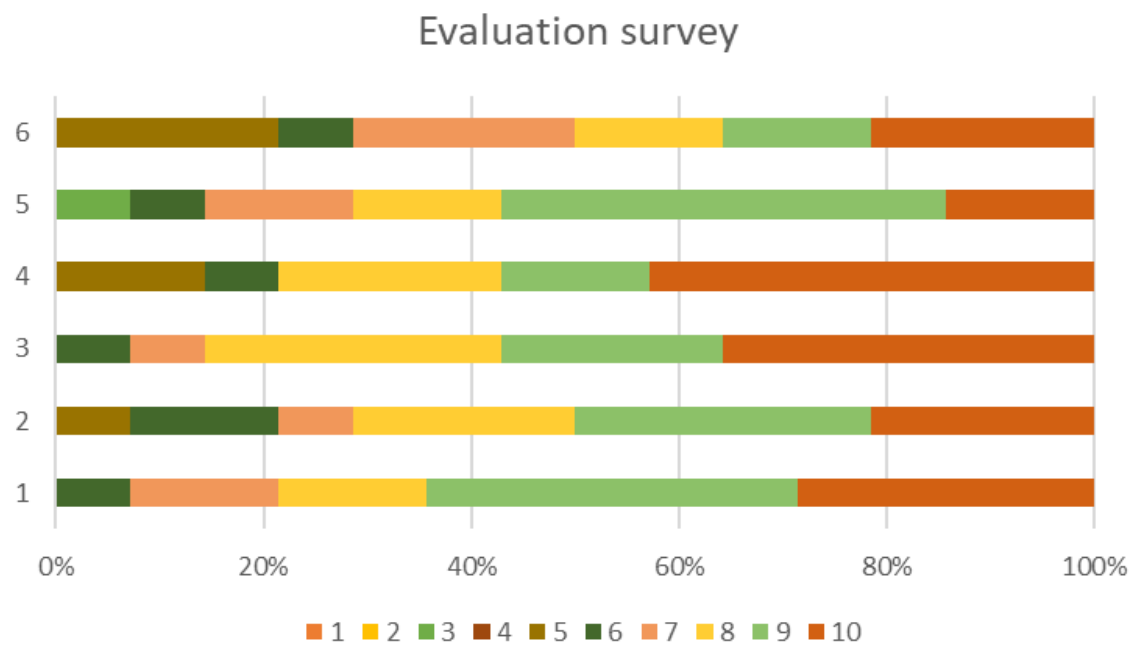
Figure 69. Demographics of evaluation.

Quantitative results

Besides the limited sample, using a detailed scale for the survey helps translate the results more concretely and makes assumptions that can be further tested in the future. Regarding the learning aspect of the tool, it is reported that all participants considered it added value to the physical product through the provided digital narrative formats. More precisely, almost 65% of the participants think that the application helped them learn more about the product, while half of them liked the textual and sound narratives as a way to transmit this knowledge.

Concerning the perspective of the participants towards the products and if it changed through the application's use, almost 60% state that it added value to the way they perceive the product and made them feel more connected to it, e.g. by triggering personal memories or emotions. A more difficult aspect was to measure if the participants were able to enhance their awareness regarding the multiple lives that objects have from making to several uses. The results show that, unlike with the other questions, there were also answers below five, nevertheless representing only 7% of the sample. Furthermore, when asked about their intention to follow the circular economy recommendations, only 35% gave a very positive answer. The rest answered between five and eight, showing that although their intention is positive, they

might have doubts about whether they are going to follow the instructions. These last two questions indicate that the longevity of objects might be an aspect that still needs to be better communicated to consumers. As for the legacy of the application and if the participants were generally satisfied and would recommend it to friends and family members, the results show 87% being satisfied, and 89% of them would recommend it to others. Below is a figure showing the results in detail.



1	How much do you think this application helped you learn more about the product?
2	How much did you like the available digital narrative formats?
3	How much do you think the digital narrative added value to the physical product?
4	How much do you think the digital narrative made you feel more connected to the physical product (e.g. by triggering personal memories, emotions)?
5	How much do you think this experience enhanced your awareness of multiple objects' lives and human-object relationships?
6	How likely is it for you to follow the circular economy recommendations proposed by the narrative?

Figure 70. Evaluation survey results.

Qualitative results

Cerfav had the opportunity to conduct an interview with the Atelier-Galerie team to collect their feedback. As they report, the experience is perceived as a plus for their shop operation without being intrusive or distracting. They are satisfied with the communication material they created and state that many

customers, even though they did not fill out the survey, ask for more information about certain products after consulting the narrative webpages through the QR codes. To this end, the Atelier-Galerie finds that it is a useful feature for their activities and expressed the wish to sustain it and further promote it in their premises, even after the project's end.

Further comments were gathered through the surveys, where it was mentioned that it was generally a good idea to offer more contextual information about retail products through a digital tool. Some also indicated aspects that could be enhanced, such as the webpage layout and the inclusion of more visual material to show the proportion of the object and the general context in which it was produced, i.e. include not only visual material of the object and making but also of the people, the workshop, the environment, and so on.

In summary, participants overwhelmingly found that the digital tool added significant value to the physical product and reported that it could deepen their emotional connection to the product, often by evoking personal memories. However, measuring awareness of an object's lifecycle proved more challenging. These findings suggest that communicating the longevity of objects remains an area for improvement. Feedback from the Atelier-Galerie team reinforced the tool's benefits, noting it enhanced customer engagement without being intrusive, and expressed interest in sustaining its use. Participants also praised the concept of providing digital context for retail products, while suggesting improvements to enrich the narrative experience.

6.5 Impact pathway

The Retail dimension (Dimension 3 - D3) offers craft products digital aspects to enhance their marketing and commercial value. The primary stakeholder groups of this dimension are the craft practitioners/shopkeepers and customers. According to our analysis of Europeana's Impact Framework and use of the Playbook, below is a table showing how D4 targets specific strategic perspectives (impact types) and values.

Table 18. D3's impact pathway

Dimension	Strategic perspective (Impact type)	Value lens
D3 Retail	SP2 Economic	VL2 Existence
		VL4 Learning
	SP4 Operational	VL1 Utility
	SP5 Environmental	VL1 Utility

In summary, it can be said that the value of existence could be amplified through this retail digital tool by personalising experiences and tying products to individual stories and emotions. Encouragement to think about an object's lifecycle and history could further valorise the experience, but it is difficult to measure and transmit. This result suggests that meaning is often derived from emotional resonance and narrative, even if the broader existential context (like sustainability or object history) is less immediately apparent to some.

Regarding the overall learning value that the tool can offer, it can be suggested that it enriches the consumers' knowledge by transforming the products from mere objects into educational experiences by connecting them to the stories of the craft practitioners and craftsmanship. Furthermore, it fosters the consumers' curiosity about the broader making environment, thus nurturing a deeper appreciation of the product's journey. These underline how digital storytelling can turn everyday objects into opportunities for discovery, making learning personal, contextual, and memorable. The feedback suggests that multimedia storytelling could further strengthen this educational impact. Although economic impact was not planned to be measured in monetary terms, we wanted to show how, by adding meaning to retail products through digital storytelling, sales could become more personalised.

Regarding the operational impact of such a tool for shopkeepers, as the Atelier-Galerie team reports, the tool is a valuable addition for retail activities, especially because it is non-intrusive and enhances customer engagement without disrupting the shopping process and experience. Last, concerning the guidelines for an environmentally friendly use, the results indicate that while consumers recognise the importance of environmental sustainability, the long-term benefits of object longevity may not yet be effectively communicated. This highlights an opportunity to strengthen messaging and education around the practical and environmental advantages of circular economy principles, ensuring consumers feel more confident and motivated to act.

7 Maker Culture

Maker culture is understood as a technology-driven evolution of DIY, where digital tools extend the maker's ability to design, simulate, and control form in preparation for fabrication. The maker movement's open and sharing-oriented ethos further supports uptake, transfer of know-how, and community learning. Within craft contexts, a particularly relevant role of digital manufacturing is the production of intermediate tooling (rather than finished goods), because tooling can be reused, adapted, shared, and combined with familiar hands-on processes.

7.1 Rationale: Why the maker movement?

Reaching out to the maker movement is not a branding exercise; it is a practical pathway to strengthen contemporary craft and create new jobs around small-scale, localised production. The maker movement has grown in parallel with a 'tools revolution' that makes prototyping and fabrication accessible outside industrial settings [48]. This changes who can make, what can be made, and how quickly ideas can become products. For craft, that shift is especially valuable because craft is already an economy of materials, skill, iteration, and quality.

Craft practice has always depended on tooling to stabilise form and repeatability. Personal fabrication tightens the loop between digital descriptions and physical artefacts, so that learning, experimentation, refinement, and reproduction become more fluid and more local, such as for craft micro-enterprises [49].

Makerspaces build the behaviours that underpin innovation and employability, such as rapid iteration, problem-solving, design thinking, and interdisciplinary competence [64]. For craft, this is directly job-relevant: today's craft roles increasingly combine making with digital design, documentation, small-batch manufacturing, and online distribution.

The maker movement is already an entrepreneurship pipeline [69]. Reaching makers, therefore, expands the pool of people who can become 'new crafts professionals' and helps existing craftspeople adopt entrepreneurial practices without abandoning the values of quality and material understanding.

Following a job creation motivation, it is postulated that lowering barriers to economic participation, while professionalising practice. The European Commission's work on the collaborative economy notes the potential for new forms of work and market participation [65]. Research links maker ecosystems to renewed small-scale manufacturing, institutional partnerships, and place-based economic activity [70]. Deloitte similarly frames the maker movement as a capability-building shift: shared spaces and accessible tools combine with communities of practice to accelerate learning and production [68].

Reaching the maker movement is a direct investment in the future of crafts and employment. It expands access to modern tools, cultivates the skills and behaviours needed for hybrid craft–digital roles, and strengthens micro-entrepreneurship pipelines [46, 64, 69]. The opportunity is biggest when the activity is designed as a bridge: craft-led workflows that makers can replicate, improve, and adopt, paired with responsible guidance on safety, quality, and viable routes to market [65, 66, 67, 68, 70].

7.2 Use Case Plan

To assess our reach capacities, we designed an exploratory project. This exploration targeted the simplicity, accessibility, and feasibility of the activity and thus the reach and viability of the corresponding product and related activities. The activity relied on ordinary domestic equipment rather than specialised workshop tools.

A series of moulds based on chess pieces was designed digitally in the Design Studio and fabricated using 3D printing. These moulds were then used in moulding and casting experiments with various materials.

The methodology involved designing moulds digitally, fabricating them via 3D printing, and then subjecting them to a series of material experiments using accessible, household resources.

The study aimed to evaluate:

1. Technical Feasibility: Can simple 3D-printed moulds produce high-quality artefacts?
2. Material Engagement: Which materials (plasticine, clay, soap, wax) offer the most rewarding 'making' experience?
3. Accessibility: Can this be done in a domestic setting (the 'Kitchen Workshop') to appeal to a broad maker audience?

The objective was to probe which playful, accessible toys and activities relate to digital fabrication and maker culture. This should contribute to engaging interested audiences and serve the crafting and interpretation of designs.

- We plan to bring in the makers with the moulds. To make the exploration concrete, we selected a set of geometrically mouldable 3D models and investigated the materials and the activities that can be carried out with them. In other words, we explored the domain of materials and situations for which our idea is viable.
- Bring families in with the kitchen making. In this use case, we interpreted this challenge as a requirement to transform a given design into a playable artefact using everyday materials and domestic equipment. The activity was intentionally constrained to household means to enhance accessibility and replicability outside specialised workshops.
- Bring the tutors in for expert insights. The facilitation of making activities by tutors exhibits a plethora of advantages in terms of authenticity, safety and quality of content, and diversifies the income of makers and practitioners. In essence, while the proposed activities may be based on open designs, individual creations, or specific commissions, the role of the knowledge and tutors remains central, whether live or through the pages, media, and interaction of a tutorial.
- Use the STEM topics for e-learning.

Following this thought, we strive to make the activity achievable in a domestic and school/playground workshop environment. We also consider that the toys (or at least the 'protagonist' of the tools, the mould) are built around a desktop 3D printer. Even if not own one, makers typically share FabLabs for digital fabrication equipment (3D printer). This enables makers and FabLabs to take mould design commissions. Though access to equipment does not hinder reaching makers, it obstructs the reach of wider audiences. For this case, prefabricated mould pieces can be marketed along with the usage tutorial, which is part of the product. Users can order more designs, and advanced users can design their own.

7.3 Synergies across use cases and new product dimensions

7.3.1 Mould design

The current investigation gave feedback to the mould design process, which was updated to facilitate the use of specific materials. We assume the mould variants used are already available, because our focus is on the properties of materials and corresponding activities that moulds can support, as parts of marketed products (toys, activities). However, it is worth noting that this exploration informed the design of said mould variants. Multipart variable versions were influenced by the deformation process, particularly for inelastic materials whose demouldability is inflexible (rigid).

7.3.2 Chess pieces design

Moreover, instead of selecting an arbitrary design to carry out our investigation, we sought inspiration in chess piece designs. This choice aims to reuse this study for the benefit of a 'sister' use case (Chess Project), in this deliverable. The geometrical variability of pieces in chess sets allows for an advance in geometric requirements, from the simplicity of pawns to the (potentially) intricate structures found in the king and queen pieces.

7.3.3 e-Learning extensions

The affordances of materials and their modulation through state transformations, due to pressure or heat, and the appropriate tools to work this transformation, are topics compatible with physical and STEM in general. The distinct colouration difference is required, triggering the exploration of material dyeing and chemistry.

7.4 Implementation

The exploration quickly crystallised into a practical comparison between moulding and casting, as dictated by the properties of the available range of materials, as well as treatment methods.

A series of moulds based on chess pieces was designed in the Design Studio and fabricated using 3D printing. These moulds were then used in moulding and casting experiments with plasticine, clay, soap, and candle wax. The activity relied on ordinary domestic equipment rather than specialised tools, reinforcing the project's focus on accessibility. Iterative trials evaluated for technical feasibility, creative potential, and educational value.

Moulding experiments with plasteline and clay. The original approach was to place the moulding material in each mould half separately and then join them together. However, this turned out to be time-consuming and technically unstable. The material could not remain homogeneous at the joint line, resulting in unsatisfactory outcomes.

We advanced to evaluate casting with wax and soap. The treatment process followed a sequence: preparing the moulds → melting the material → adding colour → casting into moulds → cooling → demoulding and finishing.

Iterative trials with four materials covered moulding and casting workflows. For each material, the user followed a simple protocol: prepare, introduce the material, allow it to stabilise, and demould and trim the pieces. Key parameters such as temperature, sealing of the mould with rubber bands, oiling, dosing of colour, and tapping to release bubbles were varied and recorded. Qualitative judgements of ease of use, failure modes, and perceived educational or playful value were noted as part of the evaluation.

Rather than using questionnaires or timed tasks, the study treated the domestic kitchen as a 'living lab' in which usability, robustness, and creative potential emerged through repeated everyday use. The insights of this study were synthesised to assess how well the moulds support non-expert users in transforming designs into artefacts, and to identify ways that make the process reliable for home, workshop, and educational contexts. We concluded that casting is better suited for detailed and consistent results.

See Annex F. The study was conducted as a practice-based user study in a domestic environment, rather than in a specialised workshop. Over several sessions, this user documented their attempts to produce complete chess pieces, keeping informal 'domestic lab notes' and photographs that recorded both successful casts and failed experiments.

7.4.1 Evaluation results

The trials indicate that non-expert users, working with ordinary kitchen tools, can reliably transform digital designs into tangible artefacts such as a full soap chess set. Everyday equipment was sufficient to support the process, provided that users follow a few procedural cues: low and controlled heat, accurate dosing of colour, oiling of the moulds, and basic bubble-prevention strategies.

Materials

We experimented with the materials in the table below. The table summarises our findings on the utilised materials.

Table 19. Findings on the utilised materials

Plasticine	Overly malleable, resulting in distorted shapes upon demoulding.
Clay	Unstable at the seam line when joining halves, producing unsatisfactory results.
Soap	Highly successful after adjustments. Oiling, alcohol spray, and tapping significantly improved outcomes. A full soap chess set was produced with detailed pieces.
Candle Wax	Early trials suggest promising results, raising the possibility of a complete candle chessboard.

Workflows

The evaluation differentiated between moulding and casting workflows. The contrast between the two approaches was clear: moulding was faster but produced coarser, less reliable outcomes for detailed chess geometry, while casting was slower but capable of fine, consistent detail when process parameters

were controlled. Soap casting became the most successful pathway after small procedural refinements (oiling, alcohol spray, tapping, careful sealing), culminating in a complete soap chess set with consistent pieces. Early wax trials were also promising, suggesting a plausible extension to a full candle-based set.

The soap-based experiment demonstrated that 3D-printed moulds can reliably produce intricate and durable artefacts using only household resources. Moulding is quicker but imperfect. Pressing plasticine and clay into the moulds proved fast but unsatisfactory: pieces were difficult to demould, prone to distortion, and unstable at the seam line when halves were joined. By contrast, casting soap and candle wax into the same moulds, after some parameter tuning, produced detailed, consistent, and structurally sound pieces. Users experienced casting as slower and more demanding in terms of control, but the quality gains were substantial, establishing casting as the preferred technique for fine detail.

The experiments showed that mould design strongly conditions user success. Two-part moulds suffice for simpler geometries, but pieces that include undercuts make release difficult. Four-part moulds reduce breakage and sticking, as each section is withdrawn along a different axis. From the user's standpoint, this design change does not add complexity to handling but greatly improves demoulding reliability and perceived robustness of the system. In this sense, the transition from two- to four-part moulds is experienced not as an advanced expert feature but as a usability enhancement due to geometric necessity.

The learning curve observed supports the suitability of these moulds for informal education. Early failures were converted into practical heuristics: melt slowly on low heat, oil the moulds before use, tap the moulds to release air, and spray alcohol to burst surface bubbles. The process demonstrated flexibility and encouraged further exploration, as indicated by its successful extension to candle wax after an initial period of refinement. Feedback from each 'failed' batch enabled the user to achieve clean, repeatable casts, suggesting the system was perceived as valuable.

7.4.2 Key results and observations

The evaluation suggests that 3D-printed moulds for chess pieces offer an accessible, robust, and engaging interface between digital design and hands-on craft, suitable for home learning, family workshops, and informal educational contexts.

The activity demonstrated clear educational and social value. Children engaged with the moulds by repurposing them for plasticine play, turning technically unsuccessful material trials into open-ended creative use. The successful production of a soap chess set and experimental candle pieces showed that a single 3D-printed mould design can anchor both structured making tasks and playful exploration.

The activity surfaced an important engagement dimension: once the moulds existed, they naturally invited play, remixing, and participation. This reinforced the study hypothesis: 3D printing can be compelling for maker and craft audiences when it functions as an enabler of playful material exploration and social making, not only as a route to producing finished plastic objects.

7.4.3 Design insights for marketable toys

Two transferable insights emerged. First, for accessible public-facing 'making games' that aim to produce recognisable, high-detail results, casting in domestic conditions is often more robust than pressing/moulding with soft solids. Second, mould design is a geometric problem as much as a fabrication problem: release constraints and undercuts make two-part moulds insufficient, motivating multipartite moulds for clean demoulding of complex forms.

Moulding experiments with plasteline and clay turned out to be time-consuming and technically unstable. The material could not remain homogeneous at the joint line, resulting in unsatisfactory outcomes.

We advanced to evaluate casting with wax and soap. The treatment process followed a sequence: preparing and oiling the moulds → melting the material at controlled temperatures → adding colour in precise ratios → casting into sealed moulds → cooling or freezing to accelerate curing → and demoulding and trimming. Iterative trials highlighted the importance of temperature control, mould sealing, and bubble prevention techniques.

The creative mood didn't stop there. Using the same process, casting was also tested with a candle, with an equally successful result.

7.5 Main Product Concept: Crafting Activity

The main crafting activity is the **Kitchen Casting Game**, a “make–pop–play” exercise designed for informal settings (home, classroom, workshops) using **3D-printed moulds based on chess pieces**. The activity invites participants to explore how a digital design can become a tangible object through a small number of repeatable steps and everyday tools, emphasising experimentation and playful iteration rather than “perfect craft outcomes”.

At its core, the activity demonstrates the distinction between **casting** and **pressing/moulding**. Casting involves melting a material (e.g., soap or candle wax), pouring it into the mould, and allowing it to solidify, which captures fine details reliably; pressing uses malleable solids (e.g., plasticine or clay), which is easier but typically produces coarser or unstable results, especially at seams and when demoulding.

In the validated kitchen workflow, users (i) oil the mould, (ii) melt a measured soap base (e.g., 100 g) gently, (iii) optionally add colour in a controlled ratio, (iv) pour into sealed mould halves (secured with rubber bands), (v) reduce bubbles by tapping/spraying alcohol, (vi) let the cast harden, and (vii) unmould and trim the piece; where heat is involved, adult supervision is required.

*T*he complete step-by-step tutorial, worksheets, and supporting assets are provided in **Deliverable D4.3, Sections 5.2–5.3**; here, we summarise only the activity concept needed to contextualise Maker Culture valorisation and packaging decisions.

7.6 Packaging

Packaging is treated as part of the Maker Culture intervention because the goal is not only to define a crafting activity, but to make it **self-contained, reproducible, and easy to adopt** by non-expert users. For the Kitchen Casting Game, the deliverable assets therefore include: (i) a **box design** (front/back) that

communicates the kit identity and contents, (ii) a **Lab Manual** that provides the core instructions as a short booklet, (iii) a **Quickstart Video** accessed via link/QR for immediate onboarding, and (iv) simplified supporting materials for different audiences, including a **children's leaflet** and a **maker worksheet** (with a concise step checklist).

Operationally, the packaging workflow consists of preparing a small set of printable artefacts (manual/leaflet/worksheet) that mirror the validated casting protocol (preparation → melting → colouring → casting → curing → demoulding/finishing) and accompany the physical moulds and basic consumables. This turns the activity from a "description in a report" into a portable kit that can be handed to families, educators, and community facilitators, with minimal dependence on prior technical knowledge.

Note on documentation: the full printable assets (manual/leaflet/worksheet) and the box-layout graphics are documented in **Deliverable D4.3, Sections 5.2–5.3**, including the Quickstart Video link used for onboarding.

7.7 Impact pathway

The use case, The Maker Culture dimension (Dimension 4 - D4), illustrates how digital designs can be transformed into tangible objects through simple means. It shows that 3D-printed moulds are effective tools for technical exploration and creative expression. The case highlights the continuity between certainty, embodied in the precision of the digital mould, and risk, visible in the variability of casting materials and household conditions.

According to our analysis of Europeana's Impact Framework and use of the Playbook, below is a table showing how D1's use cases target specific strategic perspectives (impact types) and values.

Table 20. D4's impact pathway

Dimension	Strategic Perspective	Value Lens
D4 Maker Culture	SP2 Economic	VL1 Utility
	SP5 Environmental	VL1 Utility

In summary, the Maker Culture use case (Dimension 4 – D4) demonstrates a tangible utility-level impact for both the economic and environmental strategic perspectives. From an economic standpoint (SP2), the use case shows that digitally designed and 3D-printed moulds can function as low-cost, reusable enablers for accessible craft activities. By relying on ordinary domestic equipment and inexpensive materials such as soap and wax, the approach lowers barriers to participation, supports informal learning and family-based making, and opens pathways for small-scale productisation (e.g. kits, workshops, educational toys). This contributes to economic utility by enabling makers, FabLabs, and educators to reuse digital designs across multiple activities and contexts without significant additional investment.

From an environmental perspective (SP5), the use case achieves utility value through material efficiency, reusability, and reduced waste. The reuse of durable 3D-printed moulds across multiple casting cycles limits the need for single-use forms, while the preference for readily available, low-impact materials

supports experimentation without excessive resource consumption. The domestic-scale workflows promote awareness of material behaviour, process control, and failure management, encouraging responsible use rather than extractive or industrial production logic. Together, these characteristics position the activity as an environmentally mindful making practice that aligns with principles of reuse, longevity, and low-resource experimentation.

Overall, the impact reached is best characterised as practical and enabling rather than transformative: the use case does not aim to restructure production systems, but to provide usable, replicable tools that support economically viable and environmentally responsible engagement with craft through digital fabrication.

8 Results

This section consolidates the findings of the pilot by reintroducing the pilot impact pathway framework and summarising results across all impact dimensions and types. It synthesises the evidence collected throughout the implementation and evaluation phases, combining quantitative indicators, qualitative insights, and illustrative examples from the participating RCIs. The objective is to present a clear and structured overview of the impact achieved, as well as to identify limitations and directions for future development.

8.1 Overview of Impact Pathways

The pilot impact pathway table provides a consolidated view of how CRAEFT tools and methodologies contributed to outputs, outcomes, and impacts across the different strategic perspectives. For each dimension, the table summarises the intended impact, the activities implemented, the results observed, and the level of impact reached. This overview allows for a comparative assessment across use cases and highlights patterns of effectiveness as well as context-dependent variations.

The cross-dimension results reported in this section are derived by mapping each use case to Europeana's Impact Framework (Strategic Perspectives and Value Lenses) and then consolidating evidence from the instruments and observations used across pilots (e.g., questionnaires, interviews, workshop feedback, and utilisation-based case studies). For each dimension, findings are summarised at two levels: (i) key outcomes per Value Lens within each Strategic Perspective, and (ii) an overall dimension-level narrative that highlights strengths, limitations, and actionable improvement needs.

8.2 Quantitative Results

Quantitative indicators were used to capture measurable aspects of pilot performance and utility, where applicable. While the pilots were not designed as large-scale experimental deployments, several key performance indicators (KPIs) provide evidence of practical impact:

- **Material efficiency**: In digitally supported craft activities (e.g. mould design and reuse), repeated use of digital designs and reusable artefacts resulted in reduced material waste compared to traditional single-use approaches.
- **Time efficiency**: Digital preparation and reuse of assets (e.g. VR scenarios, 3D models, or mould designs) reduced setup time for repeated demonstrations, workshops, or educational sessions.
- **Engagement metrics**: Pilots involving immersive or interactive tools (e.g. VR glass gathering experiences) demonstrated sustained user engagement during short sessions, particularly among younger audiences.
- **Design reuse and scalability**: A growing number of digital assets (e.g. 3D designs, recorded scenarios) were reused across multiple sessions, contexts, or audiences, indicating scalability beyond a single pilot instance.

These quantitative results confirm that the CRAEFT tools provide operational value at the utility level, supporting repeatable and resource-efficient craft-related activities.

8.3 Qualitative Results

Qualitative findings were collected through expert assessments, ethnographic observations, informal interviews, and user feedback sessions. These insights provide a deeper understanding of how the tools were perceived and used in practice.

Participants consistently highlighted the value of digital tools as **mediators** rather than replacements of craft knowledge. Immersive experiences were perceived as particularly effective for explaining complex or inaccessible processes (e.g. glass gathering from a furnace) safely and engagingly. Practitioners and educators emphasised that the tools supported storytelling, contextualisation, and discussion, especially when working with non-expert or younger audiences.

Lessons learned include the importance of:

- Keeping interactions simple and focused on emblematic actions,
- aligning digital content with real craft environments and practices,
- and avoiding over-engineered solutions that could hinder adoption by practitioners.

Subjective experiences also pointed to increased curiosity, attentiveness, and appreciation of craft complexity among users, particularly in educational and outreach contexts.

8.4 Illustrative Examples from RCIs

Specific examples from the RCIs demonstrate how CRAEFT tools were applied effectively in different craft domains:

- **Glassblowing (CERFAV)**: The VR glass gathering scenario allowed users to experience a critical and hazardous step of the glassmaking process that is normally inaccessible. The application proved particularly suitable for cultural mediation sessions with pupils, such as organised “VR afternoons”.
- **Silversmithing and small-scale making**: Digital design and fabrication workflows supported experimentation and reuse, enabling participants to iterate on forms while maintaining low material and economic costs.

These cases illustrate the adaptability of CRAEFT tools across different craft traditions and educational or cultural settings.

9 Discussion

The Craeft D6.3 deliverable presents the Valorisation Pilot (P3) as a structured attempt to translate craft research into practical, reusable outputs that increase the value, visibility, and long-term viability of traditional European crafts. It does this through four complementary "valorisation dimensions" covering multiple RCIs (e.g., silver, wood, glass, ceramics, textiles) and evaluating a set of concrete tools and activities (apps, tours, VR, playful learning, retail storytelling/provenance, DIY making workflows). The overall picture is that the pilot's tools largely achieved their intended purpose: they improved access to craft knowledge, generated strong engagement and satisfaction, and created plausible pathways from digital interaction to real-world interest, visits, and purchases, while also meeting or exceeding the pilot's own KPI targets (e.g., 50+ digital artefacts, 100+ new products, 5+ new services, 4+ emerging professional profiles).

9.1 Interpretation of findings

In the context of the pilot's original objectives, the evaluation results indicate that "valorisation" was successfully treated as more than marketing: the pilot demonstrated that digital mediation can *add* cultural and social meaning (learning, emotional connection, contextual understanding) while also supporting economic aims (visibility, trust, differentiation, sales and tourism intent). The Experiences dimension is a strong example: the Yecla virtual museum/360 experience performed well not only as a "nice-to-see" tour, but as an interpretation tool that supported learning and motivated follow-up actions (e.g., interest in workshops and related places), with high overall satisfaction and particularly strong responses from visitors who were not already familiar with the local context. That matters because it shows the tools are effective for audiences who most need mediation rather than only reinforcing existing enthusiasts.

The Margarites pottery village tour demonstrates a different kind of success: instead of maximising interactivity, it validates a lightweight, place-based approach that preserves the "living ecosystem" character of a craft settlement and keeps the technical burden low for local practitioners. The evaluation here is expert-driven, so it cannot claim the same behavioural evidence as larger user surveys, but it does confirm feasibility, cultural adequacy, and transferability as a model for other villages and craft routes.

Across Games, Retail, and Makers, the results collectively suggest that Craeft's tools succeeded because they match craft realities: they are practical, varied in complexity, and designed to work in real settings (museums, schools, workshops, tourism contexts, and market channels). Games and workshops show learning through doing while Retail and Makers provide the "bridge to value" that craft communities often lack: provenance, storytelling, trust signals, and low-waste making workflows that can be used at home or in informal learning contexts.

9.2 So what?

9.2.1 Preservation of cultural heritage

The pilot contributes to safeguarding ICH by keeping craft knowledge attached to authentic contexts: places (villages, workshops), people (makers), and processes (tools, materials, sequences). 360 tours,

mobile interpretation, VR experiences, and object biographies don't just "show objects"; they preserve and communicate the relationships that make crafts meaningful, how techniques live in communities, how tools and materials are used, and why specific local traditions matter. A key finding is that these approaches work well for those without prior knowledge, which is essential for intergenerational and cross-cultural transmission.

9.2.2 Economic sustainability of crafts.

The Retail dimension is particularly significant because it tackles a real market problem: crafts struggle to compete with mass production without credible ways to communicate authenticity, provenance, and value. By providing structured product contextualisation (stories, maker/origin information, sustainability and circular-economy framing) and linking this to digital access points (e.g., QR), the pilot strengthens differentiation and consumer trust; two prerequisites for fair pricing and sustained demand. The Experiences dimension also supports the economy indirectly by turning digital engagement into intent to visit workshops/places, which supports tourism-based income and local ecosystems rather than only online attention.

9.2.3 Development of new professions

The deliverables' "new professions" framing is not abstract: the pilot outputs imply concrete hybrid roles: cultural technology mediators who can work between artisans and institutions; experience designers who can translate craft knowledge into tours, VR, and learning media; and digital retail/provenance storytellers who can support makers with narratives, assets, and authenticity documentation. Importantly, these roles are compatible with practitioner-led models (low technical overhead, respect for cultural specificity), so they are more likely to be adopted rather than resisted.

9.3 Comparison to state of the art

Compared with many existing digital heritage approaches that focus either on institutional collections (object-centred museum apps) or on generic "heritage engagement," Craeft's results show a more practice-aligned and ecosystem-aligned model. The Experiences use cases move beyond static interpretation by offering spatial, continuous exploration of real environments (e.g., living craft villages and active training centres), which helps users understand craft as situated practice. This place-based emphasis also strengthens tourism valorisation in a way that typical museum apps do not.

In Retail, Craeft aligns with broader trends such as provenance systems and improved labelling (including newer tech approaches), but advances them by integrating cultural biography and sustainability narratives into a practical workflow that craftspeople and consumers can actually use. Where "state of the art" solutions can be technically impressive but socially hard to deploy, Craeft's contribution is the combination of credible cultural framing with usable tools and evaluation evidence (e.g., usability and satisfaction results).

For Games and Makers, Craeft goes beyond one-off "edutainment" by linking playful learning with tangible making practices (e.g., mould-based DIY), showing a pathway from engagement to skill development to potentially marketable artefacts. This integration is a meaningful advance over fragmented approaches that treat these as separate domains.

9.4. Limitations and future work

The main limitations are typical for pilots but still important to state clearly:

- Sample sizes and representativeness vary across activities; some evaluations are small or expert-based, which limits generalisability and makes it harder to quantify long-term outcomes.
- The pilot focuses on specific RCIs and contexts; results may not transfer unchanged to other regions, crafts, or market structures without adaptation.
- Some solutions use commercial platforms (useful for sustainability and speed), but that can constrain custom learning logic, data collection, and deeper interaction design.

Future work should therefore focus on:

- Larger and more diverse evaluations (including longitudinal follow-ups) to test retention of knowledge, repeat use, and real economic effects (visits, purchases, practitioner uptake).
- Stronger cross-dimensional integration: for example, linking Experiences directly to Retail assets (shop links, maker profiles, object biographies) and to Makers/Games learning pathways.
- Enhanced pedagogical layers where appropriate (especially for learning-focused experiences), without losing the “lightweight” property that makes adoption realistic for practitioners.
- Replication studies across additional craft clusters and regions, to validate the “replicable valorisation model” claim and document what must be customised (language, protocols, local narratives, market channels).

Annex A. The Europeana Impact Playbook

A.1 Terms & definitions

Impact: Changes that occur for stakeholders or in society as a result of activities (for which the organisation is accountable).

Outcomes: Actual or intended short, medium and long-term changes experienced by the stakeholder through their engagement with activities. These can be experienced at any point, e.g. in the long or short-term. Outcomes can be negative, positive, expected or unexpected.

Outputs: The tangible, quantifiable and measurable products and services delivered by activities.

Activities: The actual or planned actions undertaken by a person or an organisation to achieve their goals.

Resources: The investments (inputs) you are making in time and money to realise your activities.

Stakeholder: A person, group, community, or organisation expected to experience a change (that is, to benefit in some way from an organisation's work). In the impact design phase, activities and impact assessments are designed around stakeholders.

Indicator: An indicator is information that allows us to measure whether you are achieving your desired outcomes. You measure outcomes by identifying and measuring indicators.

Accountability line: Marks the dividing line between the 'impact' you contribute to and the outcomes that are directly attributable to you. In your Change Pathway, you will set out where you are and where you are not solely accountable for change, by drawing out the accountability line.

Social impact occurs when people (our stakeholders), their communities and wider society experience a positive change in their behaviour, attitude or belief because of the things that we do for them, or when actions are taken to improve the inclusivity and accessibility of a service or activity.

Economic impact occurs when our activities deliver economic benefits to stakeholders or to the organisation.

Innovation impact occurs when our work to provide access to digital cultural heritage enables innovations which lead to a positive change, economic benefits or operational efficiency for our stakeholders.

Operational impact occurs when the process of providing access to digital cultural heritage leads to innovations which, in turn, lead to an improvement or refinement of internal processes.

Environmental impact relates to both the (negative) impact of an activity (which can be expressed, for example, in terms of a carbon footprint) and the (positive) impact of an activity that mitigates against negative climate impact.

Utility lens: The focus on the value or benefit gained by people through engaging with the activities during a specific time period. The Utility lens enables us to look for evidence that people developed a new resource, changed their perspective or outlook, or used more of a resource or service.

Existence lens: The focus on the value gained from knowing that activities exist and are cherished, whether they are being used or not. We use the Existence lens to reveal evidence of how important people find the conceptual value and prestige derived from the existence of a resource or service.

Legacy lens: The focus on the value derived from the ability to pass forward or receive activities between generations and communities. The Legacy lens shows us that people who exchange resources derive a benefit from inheriting and bequeathing (passing on) these, and understand there is a benefit to be gained.

Learning lens: The focus on the value derived by a person from their ability to formally or informally learn from activities and the difference that this makes to a person's sense of culture, education, knowledge, and heritage. We want to use the Learning lens to reveal if an increase in opportunity for both formal and informal learning has been enabled, and whether it is beneficial on a personal and communal level.

Community lens: The focus on the value derived from the experience of being part of a community that engages with the activities. We want to use the Community lens to reveal people feeling better connected to their community and the subject.

Based on those definitions, we created the following tables to codify impact types and the values embedded in them.

Table 21. Impact types. Stakeholders: CH communities, institutions, organisations, society, and individuals.

Which	What	How
SP1. Socio-cultural	Behaviour, attitude, or belief of stakeholders.	Inclusivity and accessibility of service or activity.
SP2. Economic	Benefits, assets.	
SP3. Innovation	Economic benefits, operational efficiency.	Access to digital CH.
SP4. Operational	Improvement or refinement of processes.	Access to digital CH.
SP5. Environmental	Negative: Activity footprint (e.g. carbon). Positive: problem mitigation.	

Table 22. Value lenses. Beneficiaries: people

	Focus on value from	Target evidence and measurements in Craeft

VL1. Utility	Activity participation	New resource development, change of perspective or outlook, or increased usage of a resource or service.
VL2. Existence	Knowledge that activities exist and are cherished	Realisation of the importance of conceptual value and prestige from a resource or service.
VL3. Legacy	Exchange activities between social groups	Realisation of potential gain from resource exchange.
VL4. Learning	Knowledge from activities enables → sense of culture, knowledge, and heritage.	Increase in learning opportunities and their efficacy in potential personal and communal gains.
VL5. Community	Activity participation → Being part of a community	Connectedness to community and subject.

A.2 Tools

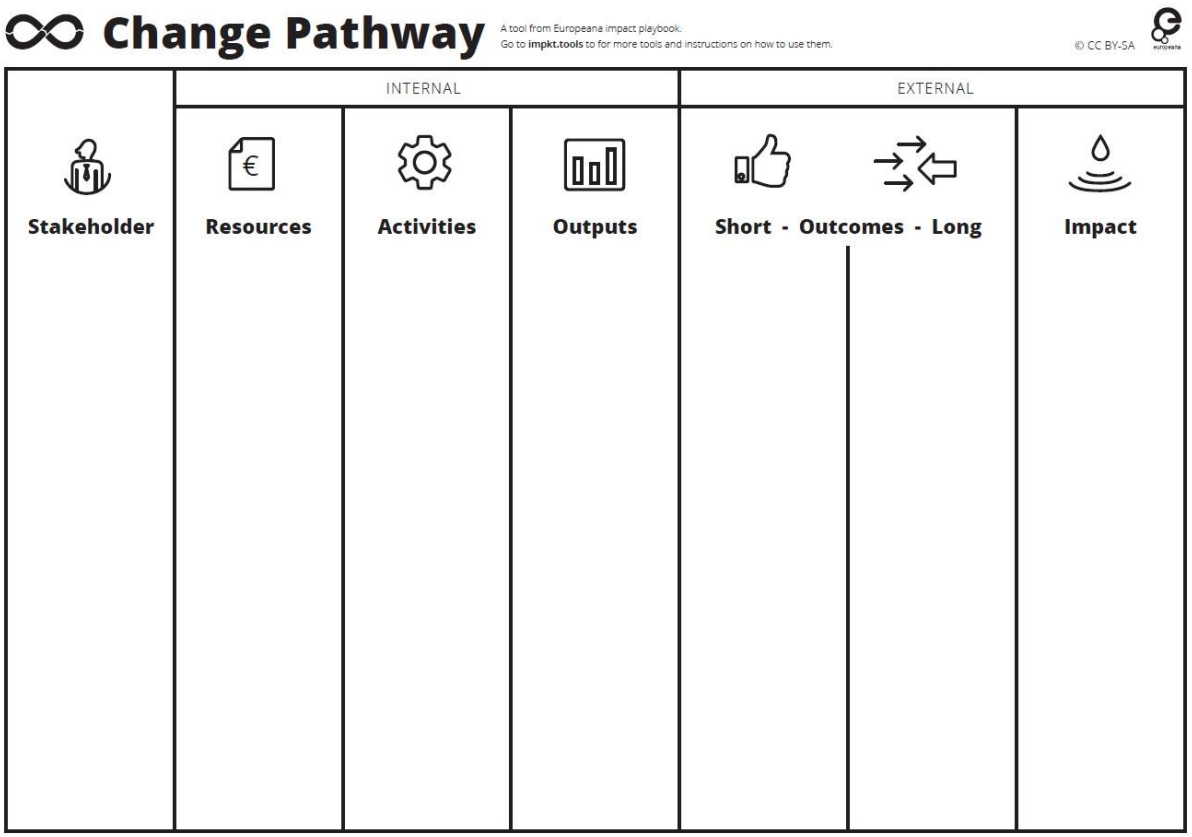


Figure 71. The Change Pathway table

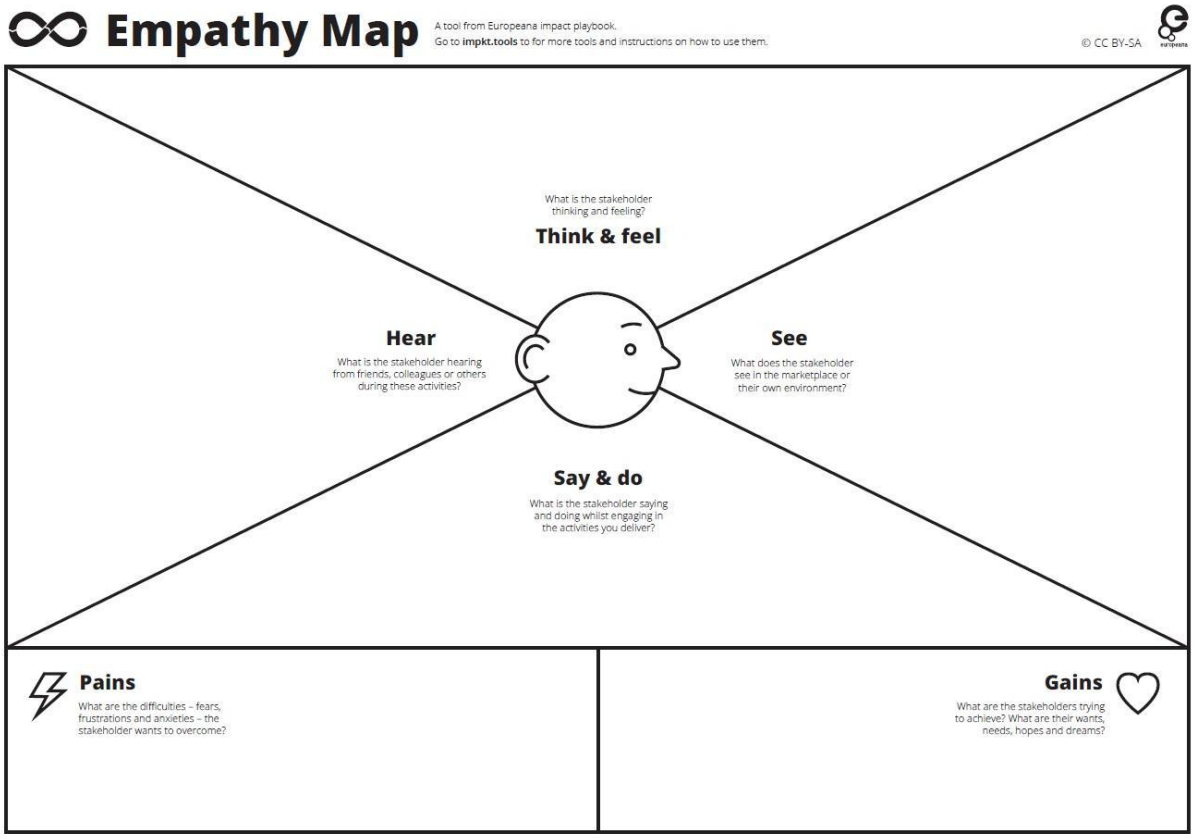


Figure 72. The Empathy Map tool

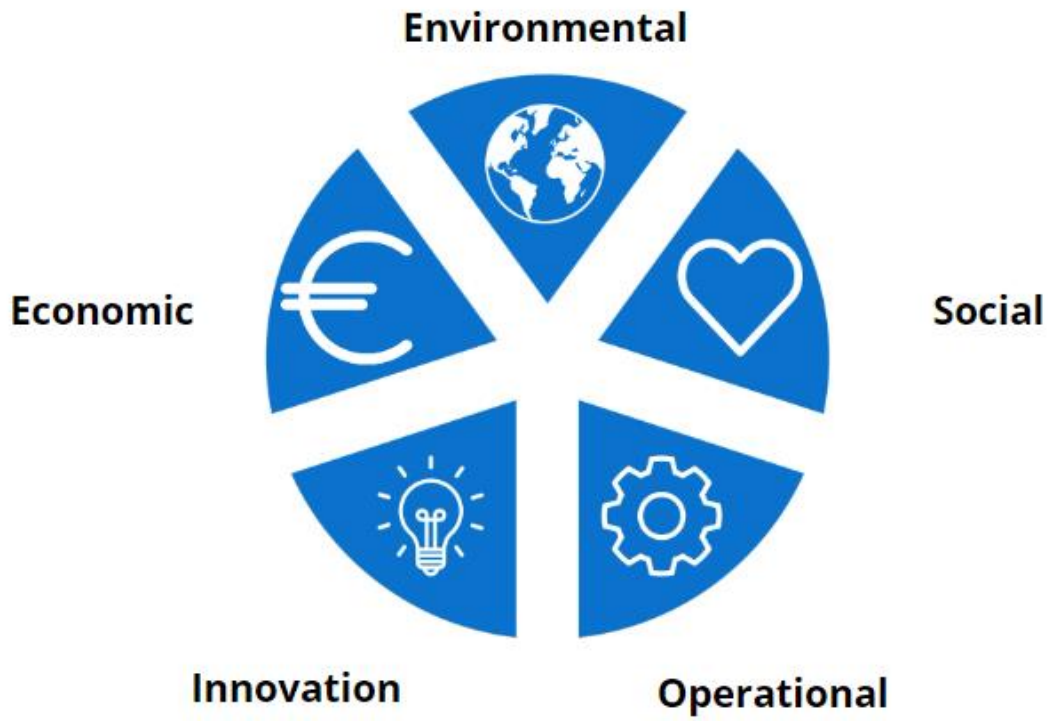


Figure 73. The Strategic Perspectives tool

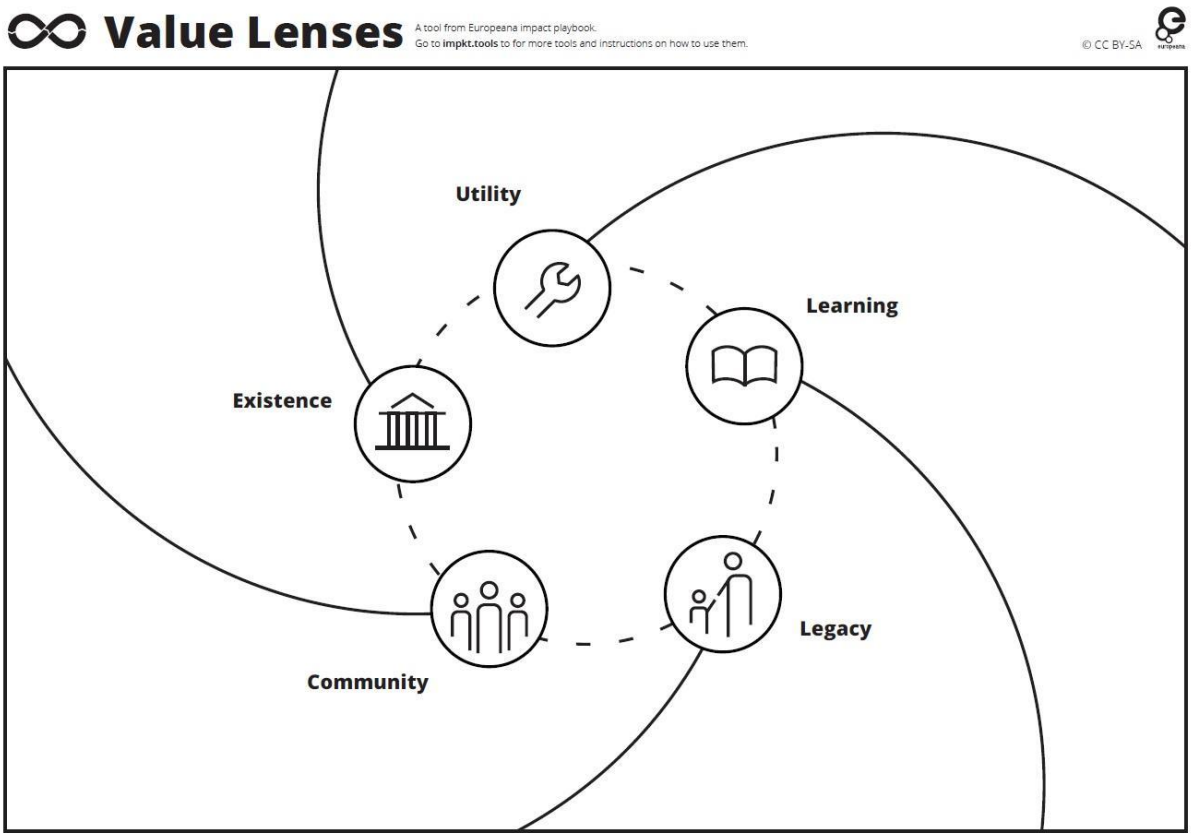


Figure 74. The Value Lenses tool

Table 23. The Dissemination Canvas tool

What (e.g. full report, infographic, executive)	Who (audience)	When	How	Call to action	Success indicators

Annex B. Evaluation surveys

B.1 Mobile Cultural Application, 'Shine Bright Like Silver'

The purpose of this questionnaire is to assess the usability and experience of using the museum's application. Your participation is voluntary and anonymous. No personal data will be collected. By submitting this questionnaire, you agree to include your answers in this study. The study is carried out in the context of the Horizon Europe research and innovation program 'CRAEFT - Craft Understanding, Education, Training, and Preservation for Posterity and Prosperity' (grant agreement no. 101094349). The results of the study will be used for research purposes and the writing of deliverables of the project, and may be published in scientific conferences and journals after statistical processing. For any further details regarding the CRAEFT project or the present study, please contact Dr Xenophon Zabulis at: zabulis@ics.forth.gr. Thank you for your participation!

PART A

This part of the questionnaire consists of pairs of contrasting characteristics that may apply to this museum application. Express your agreement with an adjective by ticking the circle that most closely reflects your impression.

Example:	attractive	●	o	o	o	o	o	o	unattractive

This response would mean that you rate the application as more attractive than unattractive.

Please mark a circle in every line, even if you are not sure about your agreement with a specific characteristic. Please respond spontaneously in order to convey your first impression. It is your personal opinion that counts. There is no wrong or right answer!

annoying	o	o	o	o	o	o	o	enjoyable
not understandable	o	o	o	o	o	o	o	understandable
creative	o	o	o	o	o	o	o	dull
easy to learn	o	o	o	o	o	o	o	difficult to learn
valuable	o	o	o	o	o	o	o	inferior
boring	o	o	o	o	o	o	o	exciting
not interesting	o	o	o	o	o	o	o	interesting
unpredictable	o	o	o	o	o	o	o	predictable
fast	o	o	o	o	o	o	o	slow
inventive	o	o	o	o	o	o	o	conventional
obstructive	o	o	o	o	o	o	o	supportive
good	o	o	o	o	o	o	o	bad
complicated	o	o	o	o	o	o	o	easy
unlikable	o	o	o	o	o	o	o	pleasing
usual	o	o	o	o	o	o	o	leading edge

unpleasant	o	o	o	o	o	o	o	pleasant
secure	o	o	o	o	o	o	o	not secure
motivating	o	o	o	o	o	o	o	demotivating
meets expectations	o	o	o	o	o	o	o	does not meet expectations
inefficient	o	o	o	o	o	o	o	efficient
clear	o	o	o	o	o	o	o	confusing
impractical	o	o	o	o	o	o	o	practical
organised	o	o	o	o	o	o	o	cluttered
attractive	o	o	o	o	o	o	o	unattractive
friendly	o	o	o	o	o	o	o	unfriendly
conservative	o	o	o	o	o	o	o	innovative

What did you like the MOST about this museum application?
[text]

What did you like the LEAST about this museum application?
[text]

PART B

Please mark the circle that corresponds to your answer in the following questions:

1. How knowledgeable were you about silversmithing before visiting the museum and/or using the application?

◦ Not at all	◦ A little	◦ Neutral	◦ Somewhat	◦ Very much

2. How much do you think this application helped you learn more about silversmithing?

◦ Not at all	◦ A little	◦ Neutral	◦ Somewhat	◦ Very much

3. How much do you think this application made you want to learn more?

◦ Not at all	◦ A little	◦ Neutral	◦ Somewhat	◦ Very much

4. Would you visit other places related to silversmithing as a result of your experience visiting the museum and using the application?

∘ Not at all	∘ A little	∘ Neutral	∘ Somewhat	∘ Very much

5. How often do you buy craft products while travelling?

∘ Not at all	∘ A little	∘ Neutral	∘ Somewhat	∘ Very much

6. Would you buy craft products as a result of your experience visiting the museum and using the application?

∘ Not at all	∘ A little	∘ Neutral	∘ Somewhat	∘ Very much

On a scale of 0 (Not at all likely) to 10 (Extremely likely), how would you rate your overall satisfaction with this application? Circle your answer below.

Extremely dissatisfied										Extremely satisfied
0	1	2	3	4	5	6	7	8	9	10

On a scale of 0 (Not at all likely) to 10 (Extremely likely), how likely are you to recommend this application to a friend or a family member? Circle your answer below.

Extremely likely										Extremely unlikely
0	1	2	3	4	5	6	7	8	9	10

Country of origin: ___

Age:

○ < 18	○ 18-24	○ 25-34	○ 35-44	○ 45-55	○ 54-64	○ 65-74	○ 75 +

B.2.1 'Yecla is Wood: An Artisanal Heritage' application (long survey)

The purpose of this questionnaire is to assess the usability and experience of using the virtual map. Your participation is voluntary and anonymous. No personal data will be collected. By submitting this questionnaire, you agree to include your answers in this study. The study is carried out in the context of the Horizon Europe research and innovation program 'CRAEFT - Craft Understanding, Education, Training, and Preservation for Posterity and Prosperity' (grant agreement no. 101094349). The results of the study will be used for research purposes and the writing of deliverables of the project, and may be published in scientific conferences and journals after statistical processing. For any further details regarding the CRAEFT project or the present study, please contact Dr Xenophon Zabulis at: zabulis@ics.forth.gr. Thank you for your participation!

PART A

This part of the questionnaire consists of pairs of contrasting characteristics that may apply to this virtual map. Express your agreement with an adjective by ticking the circle that most closely reflects your impression.

Example:	attractive	●	o	o	o	o	o	o	unattractive

This response would mean that you rate the application as more attractive than unattractive.

Please mark a circle in every line, even if you are not sure about your agreement with a specific characteristic. Please respond spontaneously in order to convey your first impression. It is your personal opinion that counts. There is no wrong or right answer!

annoying	o	o	o	o	o	o	o	enjoyable
not understandable	o	o	o	o	o	o	o	understandable
creative	o	o	o	o	o	o	o	dull
easy to learn	o	o	o	o	o	o	o	difficult to learn
valuable	o	o	o	o	o	o	o	inferior
boring	o	o	o	o	o	o	o	exciting
not interesting	o	o	o	o	o	o	o	interesting
unpredictable	o	o	o	o	o	o	o	predictable
fast	o	o	o	o	o	o	o	slow
inventive	o	o	o	o	o	o	o	conventional
obstructive	o	o	o	o	o	o	o	supportive
good	o	o	o	o	o	o	o	bad
complicated	o	o	o	o	o	o	o	easy
unlikable	o	o	o	o	o	o	o	pleasing
usual	o	o	o	o	o	o	o	leading edge
unpleasant	o	o	o	o	o	o	o	pleasant
secure	o	o	o	o	o	o	o	not secure
motivating	o	o	o	o	o	o	o	demotivating
meets expectations	o	o	o	o	o	o	o	does not meet expectations
inefficient	o	o	o	o	o	o	o	efficient
clear	o	o	o	o	o	o	o	confusing
impractical	o	o	o	o	o	o	o	practical
organised	o	o	o	o	o	o	o	cluttered
attractive	o	o	o	o	o	o	o	unattractive
friendly	o	o	o	o	o	o	o	unfriendly
conservative	o	o	o	o	o	o	o	innovative

What did you like the MOST about this virtual map?
[text]

What did you like the LEAST about this virtual map?
[text]

PART B

Please mark the circle that corresponds to your answer in the following questions:

1. How knowledgeable were you about wood carving before visiting CETEM and/or using the virtual map?

∘ Not at all	∘ A little	∘ Neutral	∘ Somewhat	∘ Very much

2. How much do you think this virtual map helped you learn more about wood carving?

∘ Not at all	∘ A little	∘ Neutral	∘ Somewhat	∘ Very much

3. How much do you think this virtual map made you want to learn more?

∘ Not at all	∘ A little	∘ Neutral	∘ Somewhat	∘ Very much

4. Would you search for and visit wood carving workshops in Yecla as a result of your experience visiting CETEM and using the virtual map?

∘ Not at all	∘ A little	∘ Neutral	∘ Somewhat	∘ Very much

5. Would you visit other places related to wood carving as a result of your experience visiting CETEM and using the virtual map?

∘ Not at all	∘ A little	∘ Neutral	∘ Somewhat	∘ Very much

On a scale of 0 (Not at all likely) to 10 (Extremely likely), how would you rate your overall satisfaction with this virtual map? Circle your answer below.

Extremely dissatisfied										Extremely satisfied
0	1	2	3	4	5	6	7	8	9	10

On a scale of 0 (Not at all likely) to 10 (Extremely likely), how likely are you to recommend this application to a friend or a family member? Circle your answer below.

Extremely likely										Extremely unlikely
0	1	2	3	4	5	6	7	8	9	10

Country of origin: ___

Age:

○ < 18	○ 18-24	○ 25-34	○ 35-44	○ 45-55	○ 54-64	○ 65-74	○ 75 +

B.2.2 'Yecla is Wood: An Artisanal Heritage' Application (short survey)

The purpose of this questionnaire is to assess the usability and experience of using the virtual map. Your participation is voluntary and anonymous. No personal data will be collected. By submitting this questionnaire, you agree to include your answers in this study. The study is carried out in the context of the Horizon Europe research and innovation program 'CRAEFT - Craft Understanding, Education, Training, and Preservation for Posterity and Prosperity' (grant agreement no. 101094349). The results of the study will be used for research purposes and the writing of deliverables of the project, and may be published in scientific conferences and journals after statistical processing. For any further details regarding the CRAEFT project or the present study, please contact Dr Xenophon Zabulis at: zabulis@ics.forth.gr. Thank you for your participation!

How knowledgeable were you about wood carving before using the virtual map? Select your answer below.

Not at all										Extremely
0	1	2	3	4	5	6	7	8	9	10

How much do you think this virtual map helped you learn more about wood carving? Select your answer below.

Not at all										Extremely
0	1	2	3	4	5	6	7	8	9	10

How much do you think this virtual map made you want to learn more? Select your answer below.

Not at all										Extremely
0	1	2	3	4	5	6	7	8	9	10

What did you like the MOST about this virtual map?
[text]

What did you like the LEAST about this virtual map?
[text]

On a scale of 0 (Not at all likely) to 10 (Extremely likely), how would you rate your overall satisfaction with this virtual map? Circle your answer below.

Extremely dissatisfied										Extremely satisfied
0	1	2	3	4	5	6	7	8	9	10

On a scale of 0 (Not at all likely) to 10 (Extremely likely), how likely are you to recommend this application to a friend or a family member? Circle your answer below.

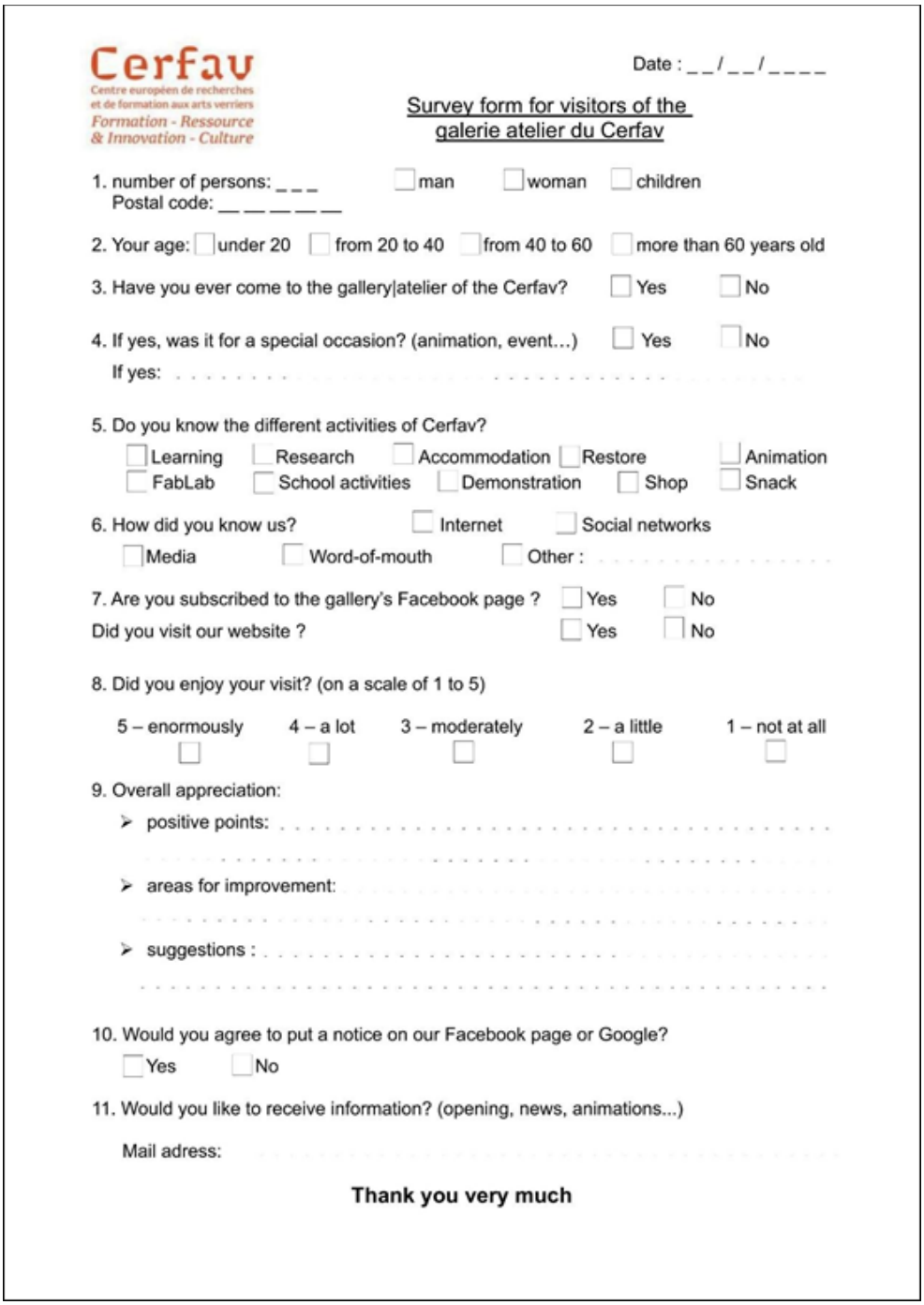
Extremely likely										Extremely unlikely
0	1	2	3	4	5	6	7	8	9	10

Country of origin: ___

Age:

o < 18	o 18-24	o 25-34	o 35-44	o 45-55	o 54-64	o 65-74	o 75 +

B.3 Cerfav pilot activities



Cerfav
Centre européen de recherches et de formation aux arts verriers
Formation - Ressource & Innovation - Culture

Date : __ / __ / ____

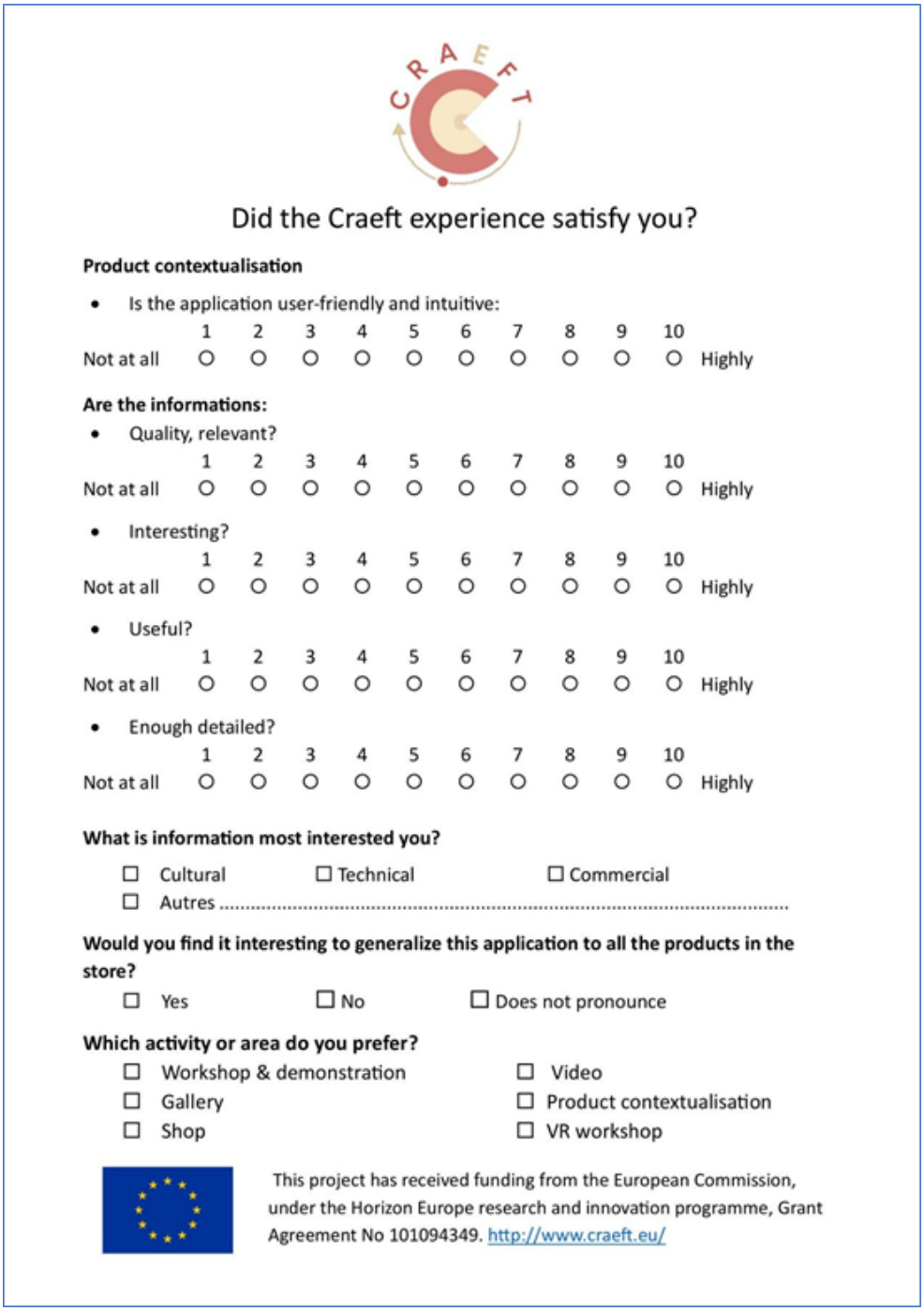
Survey form for visitors of the galerie atelier du Cerfav

1. number of persons: ___ ☐ man ☐ woman ☐ children
   Postal code: _ _ _ _ _
2. Your age: ☐ under 20 ☐ from 20 to 40 ☐ from 40 to 60 ☐ more than 60 years old
3. Have you ever come to the gallery|atelier of the Cerfav? ☐ Yes ☐ No
4. If yes, was it for a special occasion? (animation, event...) ☐ Yes ☐ No
   If yes: . . . . . .
5. Do you know the different activities of Cerfav?
   ☐ Learning ☐ Research ☐ Accommodation ☐ Restore ☐ Animation
   ☐ FabLab ☐ School activities ☐ Demonstration ☐ Shop ☐ Snack
6. How did you know us? ☐ Internet ☐ Social networks
   ☐ Media ☐ Word-of-mouth ☐ Other : . . . . . .
7. Are you subscribed to the gallery's Facebook page ? ☐ Yes ☐ No
   Did you visit our website ? ☐ Yes ☐ No
8. Did you enjoy your visit? (on a scale of 1 to 5)

5 – enormously	4 – a lot	3 – moderately	2 – a little	1 – not at all
☐	☐	☐	☐	☐

9. Overall appreciation:
   - positive points: . . . . . .
   - areas for improvement: . . . . . .
   - suggestions : . . . . . .
10. Would you agree to put a notice on our Facebook page or Google?
    ☐ Yes ☐ No
11. Would you like to receive information? (opening, news, animations...)
    Mail adress: . . . . . .

Thank you very much



Did the Craeft experience satisfy you?

Product contextualisation

- Is the application user-friendly and intuitive:

	1	2	3	4	5	6	7	8	9	10	
Not at all	○	○	○	○	○	○	○	○	○	○	Highly

Are the informations:

- Quality, relevant?

	1	2	3	4	5	6	7	8	9	10	
Not at all	○	○	○	○	○	○	○	○	○	○	Highly

- Interesting?

	1	2	3	4	5	6	7	8	9	10	
Not at all	○	○	○	○	○	○	○	○	○	○	Highly

- Useful?

	1	2	3	4	5	6	7	8	9	10	
Not at all	○	○	○	○	○	○	○	○	○	○	Highly

- Enough detailed?

	1	2	3	4	5	6	7	8	9	10	
Not at all	○	○	○	○	○	○	○	○	○	○	Highly

What is information most interested you?

☐ Cultural ☐ Technical ☐ Commercial
☐ Autres .....

Would you find it interesting to generalize this application to all the products in the store?

☐ Yes ☐ No ☐ Does not pronounce

Which activity or area do you prefer?

☐ Workshop & demonstration ☐ Video
☐ Gallery ☐ Product contextualisation
☐ Shop ☐ VR workshop

This project has received funding from the European Commission, under the Horizon Europe research and innovation programme, Grant Agreement No 101094349. http://www.craeft.eu/

B.4 Digital contextualisation of craft products

The purpose of this questionnaire is to assess the experience of using the application. Your participation is voluntary and anonymous. No personal data will be collected. By submitting this questionnaire, you agree to include your answers in this study. The study is carried out in the context of the Horizon Europe research and innovation program 'CRAEFT - Craft Understanding, Education, Training, and Preservation for Posterity and Prosperity' (grant agreement no. 101094349). The results of the study will be used for

research purposes and the writing of deliverables of the project, and may be published in scientific conferences and journals after statistical processing. For any further details regarding the CRAEFT project or the present study, please contact Dr Xenophon Zabulis at: zabulis@ics.forth.gr. Thank you for your participation!

How much do you think this application helped you learn more about the product? Select your answer below.

Not at all										Extremely
0	1	2	3	4	5	6	7	8	9	10

How much did you like the available digital narrative formats? Select your answer below.

Not at all										Extremely
0	1	2	3	4	5	6	7	8	9	10

How much do you think the digital narrative added value to the physical product? Select your answer below.

Not at all										Extremely
0	1	2	3	4	5	6	7	8	9	10

How much do you think the digital narrative made you feel more connected to the physical product (e.g. by triggering personal memories, emotions)? Select your answer below.

Not at all										Extremely
0	1	2	3	4	5	6	7	8	9	10

How much do you think this experience enhanced your awareness of multiple objects' lives and human-object relationships? Select your answer below.

Not at all										Extremely
0	1	2	3	4	5	6	7	8	9	10

How likely is it for you to follow the circular economy recommendations proposed by the narrative? Select your answer below.

Not at all likely										Extremely likely
0	1	2	3	4	5	6	7	8	9	10

How would you rate your overall satisfaction with this application? Select your answer below.

Extremely dissatisfied										Extremely satisfied
0	1	2	3	4	5	6	7	8	9	10

How likely are you to recommend this experience to a friend or a family member? Select your answer below.

Not at all likely										Extremely likely
0	1	2	3	4	5	6	7	8	9	10

Do you have any comments/suggestions? Write your answer in the box below. [text]

Country of origin: ___

Age:

○ < 18	○ 18-24	○ 25-34	○ 35-44	○ 45-55	○ 54-64	○ 65-74	○ 75 +

B.5 Papier mâché sculpting workshop

Ως μέρος της αξιολόγησης του εργαστηρίου γλυπτικής με χαρτοπολτό που πραγματοποιήθηκε στο Ειδικό Νηπιαγωγείο Κομοτηνής την Τρίτη 4 Φεβρουαρίου 2025, θα σας παρακαλούσαμε να απαντήσετε στις παρακάτω ερωτήσεις. Σκοπός είναι να αξιολογήσουμε την διεκπεραίωση του εργαστηρίου, καθώς και τις μαθησιακές δυνατότητες που μπορεί να προσφέρει στα πλαίσια της ειδικής εκπαίδευσης. Το ερωτηματολόγιο είναι ανώνυμο. Παρακαλούμε σημειώστε το τετράγωνο που αντιστοιχεί στην απάντησή σας ή συμπληρώστε κείμενο στις ανοιχτές ερωτήσεις. Εκτιμώμενη διάρκεια 5 λεπτά.

ΜΕΡΟΣ Α: Γενικά στοιχεία

Φύλο

□ Γυναίκα	□ Άνδρας	□ Διεμφυλικό άτομο	□ Μη δυαδικό άτομο	□ Προτιμώ να μην απαντήσω

Ηλικία

□ 20 - 30	□ 31 - 40	□ 41 - 50	□ 51 - 60	□ 61 <

Χρόνια επαγγελματικής εμπειρίας

□ 0 - 1	□ 1 - 3	□ 3 - 5	□ 5 - 10	□ 10 <

ΜΕΡΟΣ Β: Οργάνωση και διεκπεραίωση εργαστηρίου

Πώς σας φάνηκε η συνολική οργάνωση του εργαστηρίου;

□ Πολύ καλή	□ Καλή	□ Μέτρια	□ Κακή	□ Πολύ κακή

Πιστεύεται ότι η δραστηριότητα ήταν κατάλληλα προσαρμοσμένη στις ανάγκες των παιδιών;

□ Ναι	□ Πιθανόν ναι	□ Ουδέτερο	□ Πιθανόν όχι	□ Όχι

Τι θα προτείνατε να βελτιωθεί; [text]

Θα προτείνατε την επανάληψη του εργαστηρίου στο μέλλον;

□ Ναι	□ Πιθανόν ναι	□ Ουδέτερο	□ Πιθανόν όχι	□ Όχι

Έχετε συμμετάσχει σε παρόμοιο εργαστήριο στο παρελθόν;

□ Ναι	□ Όχι	

ΜΕΡΟΣ Γ: Μαθησιακές δυνατότητες εργαστηρίου στην ειδική εκπαίδευση

Τα παιδιά συμμετείχαν όσο μπορούσαν στο εργαστήριο.

□ Συμφωνώ απολύτως	□ Συμφωνώ	□ Ουδέτερο	□ Διαφωνώ	□ Διαφωνώ απολύτως

Το εργαστήριο συνέβαλε στην κοινωνικοποίηση των παιδιών.

□ Συμφωνώ απολύτως	□ Συμφωνώ	□ Ουδέτερο	□ Διαφωνώ	□ Διαφωνώ απολύτως

Η φύση του εργαστηρίου μπορεί να συμβάλει στην ανάπτυξη των κινητικών δεξιοτήτων των παιδιών.

□ Συμφωνώ απολύτως	□ Συμφωνώ	□ Ουδέτερο	□ Διαφωνώ	□ Διαφωνώ απολύτως

Παρατηρήσατε κάτι άλλο κατά τη διάρκεια ή μετά το εργαστήριο που θα θέλατε να μοιραστείτε μαζί μας; [text]

B.6 ‘Crafts’ Board game

Αυτή η φόρμα εξετάζει ορισμένες πτυχές της εμπειρίας σας παίζοντας το επιτραπέζιο παιχνίδι ‘Crafts’ ως μέρος της διατριβής του Ιωάννη Σιβακτάκη για το Τμήμα Επιστήμης Υπολογιστών του Πανεπιστημίου Κρήτης.

Πώς θα βαθμολογούσατε την εμπειρία σας πάνω στα επιτραπέζια παιχνίδια;

Παίζω σπάνια				Παίζω συνέχεια
1	2	3	4	5

Τι γνώση έχετε πάνω στο αντικείμενο των παραδοσιακών τεχνών με τις οποίες ασχολείται το επιτραπέζιο;

Καμία				Πολύ καλή
1	2	3	4	5

Πόσο θα βαθμολογούσατε την εμπειρία σας παίζοντας το επιτραπέζιο;

Πολύ βαρετή			Πολύ διασκεδαστική	
1	2	3	4	5

Πώς σας φάνηκε το θέμα του επιτραπεζίου;

Πολύ βαρετό			Πολύ ενδιαφέρον	
1	2	3	4	5

Η ύπαρξη QR code στις κάρτες, πόσο χρήσιμη προσθήκη ήταν για εσάς;

Πλήρως άχρηστη			Πολύ ενδιαφέρουσα	
1	2	3	4	5

Έχοντας παίξει το επιτραπέζιο, νοιώθετε να ενδιαφέρεστε περισσότερο ή λιγότερο για το θέμα του;

Λιγότερο				Περισσότερο
1	2	3	4	5

Πόσο κατανητούς βρήκατε τους κανόνες του επιτραπέζιου;

Πολύ δυσκατανόητους			Πολύ κατανοητούς	
1	2	3	4	5

Πώς σας φάνηκε η δυσκολία του όσον αφορά την εκμάθηση των κανόνων;

Πολύ εύκολο				Πολύ δύσκολο
1	2	3	4	5

Πώς σας φάνηκε η δυσκολία του όσον αφορά το 'βάθος' του επιτραπέζιου;

Πολύ εύκολο				Πολύ δύσκολο
1	2	3	4	5

Θεωρείτε ότι οι διαφορετικοί τύποι καρτών βελτιώνουν ή δυσχεραίνουν το παιχνίδι; [κείμενο]

Πώς σας φάνηκε το παιχνίδι από άποψη διάρκειας;

Πολύ σύντομο				Πολύ εκτενές
1	2	3	4	5

Ποιο είναι το κομμάτι που σας άρεσε περισσότερο; [κείμενο]

Ποιο είναι το κομμάτι που σας άρεσε λιγότερο; [κείμενο]

Πόσο πιθανό είναι να ξαναπαίζατε το επιτραπέζιο σε περίπτωση που σας δινόταν η ευκαιρία;

Σε καμία περίπτωση				Σίγουρα
1	2	3	4	5

B.7. System Usability Scale (SUS) survey

	Strongly disagree				Strongly agree
1. I think that I would like to use this system frequently	1	2	3	4	5
2. I found the system unnecessarily complex	1	2	3	4	5
3. I thought the system was easy to use	1	2	3	4	5
4. I think that I would need the support of a technical person to be able to use this system	1	2	3	4	5
5. I found the various functions in this system were well integrated	1	2	3	4	5
6. I thought there was too much inconsistency in this system	1	2	3	4	5
7. I would imagine that most people would learn to use this system very quickly	1	2	3	4	5
8. I found the system very cumbersome to use	1	2	3	4	5
9. I felt very confident using the system	1	2	3	4	5
10. I needed to learn a lot of things before I could get going with this system	1	2	3	4	5

B.8 CETEM Evaluation Survey

Questionnaire for the evaluation of the virtual map “ Yecla is Wood: An Artisanal Heritage”

The purpose of this questionnaire is to evaluate the usability and user experience of the virtual museum. Participation is voluntary and anonymous. The data collected will be processed in an aggregated form and will not allow the identification of individual participants.

This study is conducted within the framework of the Horizon Europe research and innovation programme *“CRAEFT – Craft Understanding, Education, Training and Preservation for Posterity and Prosperity”* (Grant Agreement No. 101094349). The results of the study will be used for research purposes and for the preparation of project deliverables, and may be published in scientific journals and conferences after statistical processing. By completing the questionnaire, you provide your informed consent for your responses to be used for research purposes in this study.

For further information about the CRAEFT project or this study, you may contact Juan José Ortega at: jj.ortega@cetem.es.

Thank you for your participation!

CentroTecnológico del Mueble y la Madera de la Región de Murcia

CETEM

The CRAEFT project has received funding from the European Union’s Horizon Europe research and innovation programme under Grant Agreement No. 101094349.

PART A: This part of the questionnaire consists of pairs of contrasting characteristics that may apply to this virtual map. Express your agreement with an adjective by ticking the circle that most closely reflects your impression.

Example: attractive ○ ⊗ ○ ○ ○ ○ ○ unattractive

This response would mean that you rate the application as more attractive than unattractive.

Please mark a circle in every line even if you are not sure about your agreement with a specific characteristic. Please respond spontaneously in order to convey your first impression. It is your personal opinion that counts. There is no wrong or right answer!

annoying	○	○	○	○	○	○	○	enjoyable
not understandable	○	○	○	○	○	○	○	understandable
creative	○	○	○	○	○	○	○	dull
easy to learn	○	○	○	○	○	○	○	difficult to learn
valuable	○	○	○	○	○	○	○	inferior
boring	○	○	○	○	○	○	○	exciting
not interesting	○	○	○	○	○	○	○	interesting
unpredictable	○	○	○	○	○	○	○	predictable
fast	○	○	○	○	○	○	○	slow
inventive	○	○	○	○	○	○	○	conventional
obstructive	○	○	○	○	○	○	○	supportive
good	○	○	○	○	○	○	○	bad
complicated	○	○	○	○	○	○	○	easy
unlikable	○	○	○	○	○	○	○	pleasing
usual	○	○	○	○	○	○	○	leading edge
unpleasant	○	○	○	○	○	○	○	pleasant
secure	○	○	○	○	○	○	○	not secure
motivating	○	○	○	○	○	○	○	demotivating
meets expectations	○	○	○	○	○	○	○	does not meet expectations
inefficient	○	○	○	○	○	○	○	efficient
clear	○	○	○	○	○	○	○	confusing
impractical	○	○	○	○	○	○	○	practical
organized	○	○	○	○	○	○	○	cluttered
attractive	○	○	○	○	○	○	○	unattractive
friendly	○	○	○	○	○	○	○	unfriendly

conservative	○	○	○	○	○	○	○	innovative

What did you like the MOST about this virtual map?

_____

_____

What did you like the LEAST about this virtual map?

_____

_____

PART B: Please mark the circle that corresponds to your answer in the following questions:

1. **How knowledgeable were you about wood carving before visiting CETEM and/or using the virtual map?**

   ○ Not at all ○ A little ○ Neutral ○ Somewhat ○ Very much

2. **How much do you think this virtual museum helped you learn more about wood carving?**

   ○ Not at all ○ A little ○ Neutral ○ Somewhat ○ Very much

3. **How much do you think this virtual map made you want to learn more?**

   ○ Not at all ○ A little ○ Neutral ○ Somewhat ○ Very much

4. **Would you visit other places related to Yecla's furniture industry as a result of your experience visiting CETEM and using the virtual map?**

   ○ Not at all ○ A little ○ Neutral ○ Somewhat ○ Very much

5. **Would you look for and visit woodcarving companies and workshops in Yecla as a result of your experience visiting CETEM and using the virtual museum?**

   ○ Not at all ○ A little ○ Neutral ○ Somewhat ○ Very much

6. **Do you consider that your experience using the virtual map has helped improve your perception of the "Yecla furniture" brand?**

○ Not at all ○ A little ○ Neutral ○ Somewhat ○ Very much

On a scale of 0 (Not at all likely) to 10 (Extremely likely), **how would you rate your overall satisfaction with this virtual museum**? Circle your answer below.

Not at all likely Extremely likely

0	1	2	3	4	5	6	7	8	9	10

Género: ○ Female

○ Male

○ Non-binary

○ Prefer not to say

Country: _____

City: _____

Age: ○ < 18

○ 18-24

○ 25-34

○ 35-44

○ 45-55

○ 54-64

○ 65 -74

○ 75 +

Annex C. Cultural tourism - Use Case Scenarios

C.1 Silver

The application will be downloaded from PIOP and the museum's website. On the application webpage, there will be a text description of the experience, technical requirements, and strong advice to download the application before visiting the museum because of a possibly unstable internet connection. The stakeholder downloads the application, which is available for Android and iOS. They can access the content before visiting the museum. The introductory page contains the following options to choose from:

- Techniques museum tour
- Interactive learning material
- Simulation
- Evaluate me!

The user accesses the application's content (all options) at any point, before, during, or after visiting the physical place, in this case, the city of Ioannina in Greece and the Silversmithing Museum of PIOP. Below is a description of the content and sub-scenarios of each option available in the application.

Option A – Silversmithing Techniques Museum tour

A virtual map of the museum exhibition indicates the available points that the user can visit and obtain more information.

	Focus	Available Content / Action in Application
Sand Casting	Understanding the process and tools.	Learning Material: Visitors review exhibited tools, materials, and / displays. Interactive: Users can assess and/or enhance their knowledge through interactive learning material. Simulation: A simulation of making an object using the technique is available.
Filigree	Detailed observation of a key object.	Learning Material: Visitors review exhibited tools, elements, and textual/video displays. Specific Action: Emphasis is placed on observing the miniature chest by Yiannis Mentis, scanning it, and reading an object biography. Interactive: Users can assess and/or enhance their knowledge through interactive learning material.

KE.PA.V.I.	Contemporary Craftsmanship.	Observation: Visitors are invited to observe the showcase of contemporary silver objects made by members of the Ioannina Traditional Crafts Centre.

Table 24. Virtual map of the museum exhibition

A second virtual map depicts the location of KE.PA.V.I. in the city of Ioannina. At the end of the general visit, the users can evaluate the application through a short survey.

Option B – Interactive learning material

The users can access the interactive learning material about sand casting and filigree techniques whenever they wish.

Option C – Simulation

The users can access the simulation of making an object with the sand-casting technique whenever they wish.

Option D - Evaluate me!

The users can evaluate the application at any point in their interaction.

C.2 Wood

Option A. Physical visits to CETEM

The visitors of CETEM will be invited to learn about the history of woodworking in Yecla and about woodcarving and its influence on Yecla furniture. Visitors, depending on the number of people, time and scope, will have two possibilities:

- Show the map and different points to discover in a presentation/screen and invite them to follow it on their phones/computers.
- Do an immersive experience with VR glasses: This approach would be more attractive and didactic for students.

After an introduction to Yecla Furniture and CETEM Technology Centre, visitors will be invited to participate in this cultural experience. A welcome page opens with a short text description, a link to the map, and an evaluation button.

The map will offer different places of interest that users can visit virtually and get more information. The map will connect different places of interest, creating the virtual furniture and woodcarving museum of Yecla, as there is no physical one. The different places to visit are represented in the table below.

Table 25. Virtual map of Yecla

Place	Focus	Content Provided
Workshop	Woodcarving Techniques and Tools	A 360◦ visit to a real workshop, with videos and text explanations about the techniques and tools used.
Museum	Woodcarving and Religious Art	A 360◦ visit explaining the connection between the art forms. Allows viewing and learning about the throne of the Virgen del Castillo.
Fair	History of the Fair and Local Importance	Information on the history of the oldest Spanish furniture fair and its significance for Yecla. Key wood carving crafts are available through pictures.
City Town	Yecla Furniture History	A room showing historic furniture with accompanying information on the history of Yecla furniture.
CETEM	Work and Activities of CETEM	Information to learn more about the work and activities done at CETEM. This is available for all visitors, including those not physically at CETEM.

After an introduction to Yecla Furniture and CETEM Technology Centre, visitors will be invited to participate in this cultural experience. A welcome page opens with a short text description, a link to the map, and an evaluation button.

The map will offer different places of interest that users can visit virtually and get more information. The map will connect different places of interest, creating the virtual furniture and woodcarving museum of Yecla, as there is no physical one. The different places to visit are:

The map connects different places of interest to form the virtual museum. Each point offers a visit with varying content.

The virtual map could also include an additional page with information on places 'off the map' of Yecla city. It could contain pictures, explanations, and links for those who want to learn more about it. This is a possibility that will be further investigated.

The evaluation button will direct the user to a new page with a short survey and a text box where they can leave comments/suggestions to CETEM.

Option B. Physical visits to other points

A QR code displayed in some tourist places of Yecla, such as the Museo Mariano Virgen del Castillo, the furniture fair, or the tourist information office, will allow visitors to enhance their knowledge of the furniture history of Yecla and visit other places through their mobile phones. Through the QRs, visitors could navigate the virtual map and discover other places. For instance, a visitor to the Museo Mariano

Virgen del Castillo could scan the code with their mobile phone, discover and virtually visit other places, such as CETEM or the workshop, and learn from them. This could prompt them to visit those places too, physically.

Option C. Virtual visits

Visitors to the CETEM website and the general public could access the virtual map through their digital device at home or on the road and learn more about Yecla, the local furniture and wood carving history, CETEM activity, etc.

Annex F. Casting

F.1 Mould casting learning material

This domestic study documents a series of exploratory trials using 3D-printed moulds in a home environment. The objective was to assess whether digitally fabricated moulds can be used as practical, accessible tools for small-scale making activities outside a lab or workshop.

The trials focused on two fundamental material transformation processes:

- Moulding (pressing): applying force to soft solids (e.g., clay or plasticine) so that the material conforms to the mould geometry.
- Casting (pouring): pouring a liquid material (e.g., melted soap or wax) into a mould and allowing it to cool and solidify.

Key points examined during the study included ease of use in informal settings, achievable surface/detail quality, and recurring practical issues such as bubble formation, release/demoulding, and surface finish.

The study took place in February 2025 by Vasiliki Manikaki in her home kitchen.

The activities were conducted in a domestic kitchen/workspace, selected for its availability of heat sources, washable surfaces, and everyday utensils suitable for basic material preparation. The setting reflects realistic constraints and opportunities typical of home-based craft activity (limited specialised tools, shared space, cleaning requirements, safety considerations).

The moulds used in the study were 3D-printed and intended to support both pressing and casting. Performance was therefore influenced by (i) mould topology (parting line, undercuts), (ii) surface texture introduced by printing, and (iii) the stiffness and thermal limits of the print material.

F.1.1 Treatment techniques

Several materials were trialled to understand how differently they behave when shaped and set in rigid, 3D-printed moulds. The trials also aimed to identify practical 'home workshop' requirements (temperature control, cleanliness, release strategies) that determine whether these moulds can be used reliably.

Two distinct processes were observed and compared:

- Moulding (pressing): force/pressure applied to soft solids (e.g., plasticine, clay).
- Casting (pouring): flow/solidification of liquids (e.g., melted soap, wax; optionally chocolate).

The study proceeded through iterative trials, contrasting two distinct processes: Casting and Moulding or Pressing.

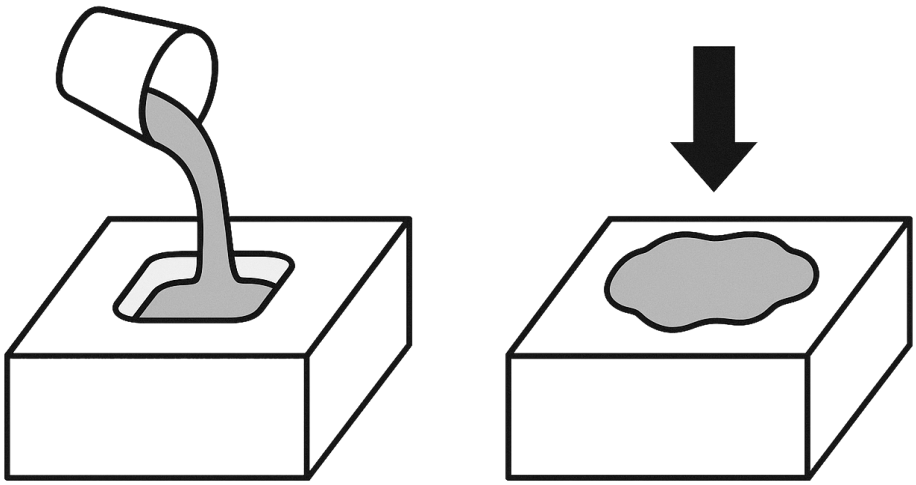


Figure 75. Casting (left) and Moulding or Pressing (right).

Key Findings: These failures highlighted a semantic and physical distinction between pressing (applying force to soft solids) and casting (pouring liquids). Pressing requires significant force and often open-faced moulds, whereas the 3D-printed containment vessels were better suited for fluids.

Table 26. Temporal layout of the two processes

	Practitioner	Material	Time	Quality
Moulding	Pushes material	Soft	Fast	Coarse
Casting	Pours liquid	Temporarily liquified	Slow	Fine

Process	Definition	Materials	Key parameters/risks
Moulding (pressing)	Force and pressure are applied to soft solids to conform to the mould geometry.	Plasticine, clay	Draft/undercuts, plasticity, release conditions, cracking/tearing on demoulding
Casting (pouring)	A liquid is poured; flow and solidification reproduce the cavity geometry.	Soap, wax, (optional: chocolate)	Temperature, viscosity, pour rate, bubble formation, shrinkage, thermal limits of mould

Table 27. Comparison of moulding and casting

Process	Step 1	Step 2	Step 3
Moulding (pressing)	Prepare material (knead/soften)	Press into the mould	Optional drying/curing
Casting (pouring)	Heat/melt material	Pour into mould	Cooling/solidification

F.1.2. Material Exploration

A small series of experiments followed to assess each material's behaviour. This experimentation highlighted how a simple 3D printed design can be a starting point for a course of material exploration, even with simple, everyday means. The transformation of moulds into practical tools for the production of objects highlighted the possibility of their use in creative, educational or even artistic contexts.

The contrast revealed why casting is better suited for detailed and consistent results.

- Moulding: a malleable material is forced and deformed into a mould. Flow and solidification are applied to liquids. Materials: Plasticine, Clay.
- Casting: the material is melted and poured. Force and pressure are applied to soft solids.

Pressing: Plasticine and Liquid Clay

Initial experiments focused on pressing malleable solids into the moulds.

Plasticine: First, we tried plasticine. Easy to work with, but extremely difficult to demoulld, as it deformed as soon as it was pulled from the mould. Despite the good intentions, the shapes were distorted, and the pieces looked more like abstract art than strategic pawns. While easy to manipulate, it proved too malleable for extraction, resulting in distorted shapes that resembled abstract art rather than strategic pawns.

Clay: We attempted to press clay into separate mould halves and join them. This proved technically unstable; the material failed to homogenise at the seam line, leading to structural weakness. The original approach was to place clay in each mould half separately and then join them together during closure. However, this turned out to be time-consuming and technically unstable - the material could not remain homogeneous at the joint line, and the result was unsatisfactory.

Figure 76. Left: A chariot piece made of plasticine. The seams due to excess material are clearly visible. Right: Using liquid clay and the mould. After drying, the clay presents cracks.

Casting: Soap and Wax

The idea was to mould soap. Although we had no previous experience with this technique, we found along the way that the necessary equipment was already available in my home. The goal was clear: to create a complete soap chessboard based solely on these moulds.

Figure 77. Melting the soap base carefully on low heat. Adding consistent colour: one drop per 100 g of soap. Casting the soap into tightly sealed moulds.

After the soap had hardened, I carefully demoulded it. I made sure to preserve all the beautiful and detailed shapes of the pieces. Sometimes, after demoulding, I would notice that the soaps had little unwanted residue or excess material on the edges. This was because the mould had not fitted perfectly, and small leaks had developed during casting. With a knife or scissors, I carefully cleaned these imperfections so that the pieces came out clean and neat.

The creative mood didn't stop there. Using the same process, casting was also tested with a candle, with an equally successful result. The thought now is: maybe the next chessboard is made… entirely of candles?

The creative mood didn't stop there. Using the same process, casting was also tested with a candle, with an equally successful result.

Figure 78. The technique used for custom candle making or dramatic games of Blitz chess.

The chess mould demonstrator illustrates how digital design can be transformed into tangible objects through simple, accessible means. It shows that 3D-printed moulds are effective tools for both technical exploration and creative expression. The case highlights the continuity between certainty, embodied in the precision of the digital mould, and risk, visible in the variability of casting materials and household conditions.

Figure 79. A piece of chocolate shaped as a rook using our moulds and the bain-marie chocolate melting method.

Comparative Assessment

The study then pivoted to casting, using materials that temporarily liquefy.

- Soap: This phase was highly successful. Using a melt-and-pour base, we established a reliable workflow involving temperature control, colouring, and curing.
- Wax: Trials with candle wax yielded similarly promising results, suggesting the potential for creating entire candle-based chess sets.

This transition demonstrated that casting is superior for achieving detailed, consistent results with 3D-printed tooling. It allows the material to flow into undercuts and intricate details that 'pressed' materials cannot reach without deformation.

Room temperature ('cold') methods use pressure as the forming principle and thereby impression moulding. If pressure is to be applied directly by a human, the material should be relatively soft. Initial impression moulding trials with plasticine and clay exposed predictable but important limitations for this use case: plasticine deformed during demoulding, while clay proved unstable at the seam line when joining mould halves, producing inconsistent results. These outcomes were still valuable in an exploratory sense because they clarified which kinds of toy-material combinations are robust enough to deliver satisfying objects without specialised tools or skills.

We therefore shifted emphasis to casting trials using soap and candle wax. The working sequence stabilised into a repeatable pattern: conditioning/oiling the mould → controlled melting → optional colour dosing → pouring into a tightly sealed mould → cooling (including freezing to accelerate curing) → demoulding and trimming. Across iterations, the dominant quality factors were temperature control, effective sealing, and strategies for preventing bubbles and voids (e.g., alcohol spray and light tapping/vibration after pouring).

F.1.3. DIY Kitchen Workshop

A process of trial, error, and experimentation succeeded in an aesthetically pleasing handmade soap chessboard. This was achieved using readily available household tools and no specialised equipment, and with significant enthusiasm, patience, and the satisfaction inherent in the creative process of seeing a tangible, fragrant object materialise.

A crucial aspect of engaging the maker audience is accessibility. We purposefully constrained the study to use only equipment available in a standard household kitchen.

List of materials for soap.

- Chess moulds (printed with a 3D printer – was the original reason for it all)
- Soap base
- Scale (to weigh exactly 100g of soap each time – crucial for colour dose)
- Knife (to cut soap)
- Coffee pot (to melt the soap)
- Chopstick or spoon (to mix)
- Gas lighter & lighter
- Rubber bands (to keep the moulds tightly closed)
- Oil (to make the pieces easier to demould)
- A glass (for the oil)
- Cotton swabs (to spread the oil carefully on the mould)
- Alcoholic lotion with a sprayer - prevents bubbles in the soap.
- Water or soap colour
- Scissors (to finish – small fixes, big results)

Figure 80. The equipment and materials for this activity can be found in a household.

As much as it looks like a professional installation, all this is already there in most kitchens. I, at least, didn't buy anything other than the soap base and the paint. Everything else was just a matter of... imagination and ingenuity.

Equipment List:

- 3D printed moulds (the only specialised tool)
- Soap base and colouring
- Kitchen scale and coffee pot (for melting)
- Wooden stirrers and cotton swabs
- Rubber bands (for clamping moulds)
- Alcohol spray (for bubble elimination)

Melt the base on low heat, keeping the kettle away from the flame and stirring constantly with a wooden stick. The soap shall melt smoothly and evenly.

Figure 81. The soap-casting workflow illustrated the key domestic steps and typical failure modes. Melting the soap base carefully on low heat.

Then colour is added. To ensure precise and consistent colouring across all batches, 100 grams of soap are weighed and melted for each trial, allowing for the accurate addition of one drop of colour per 100 grams. Subsequently, the material is decanted into the moulds, which were secured with rubber bands to prevent opening during the casting process.

Figure 82. Casting the soap into tightly sealed moulds.

F.1.4. Technical Insights

The study also served as a vehicle for technical education, translating industrial concepts for a maker audience.

Casting performance was strongly affected by temperature-dependent viscosity. If the melt is too cool, it may not flow into fine details; if too hot, it increases safety risks and can exacerbate leakage, warping, or surface defects. Domestic workflows benefit from conservative heating, steady stirring, and (where possible) monitoring with a thermometer.

Surface Tension and Bubbles

When casting soap and wax, trapped air bubbles were a recurring issue. Bubbles were introduced during stirring and pouring, and could adhere to the mould surface, particularly in small cavities and sharp corners, reducing surface quality and obscuring fine detail.

Practical mitigations in a domestic setting included:

- Pour slowly and in a thin stream into a single corner to reduce air entrapment
- Tapping/vibrating the mould gently to encourage bubbles to rise
- Avoiding vigorous stirring (which introduces microbubbles)
- Allowing the melt to rest briefly before pouring
- Using a simple surface 'burst' method (e.g., brief heat application) only if safe and appropriate

Bubble persistence depends on viscosity (rise rate) and wetting/surface tension (adhesion to the mould surface). These effects are amplified by high-detail geometries and rough printed surfaces.

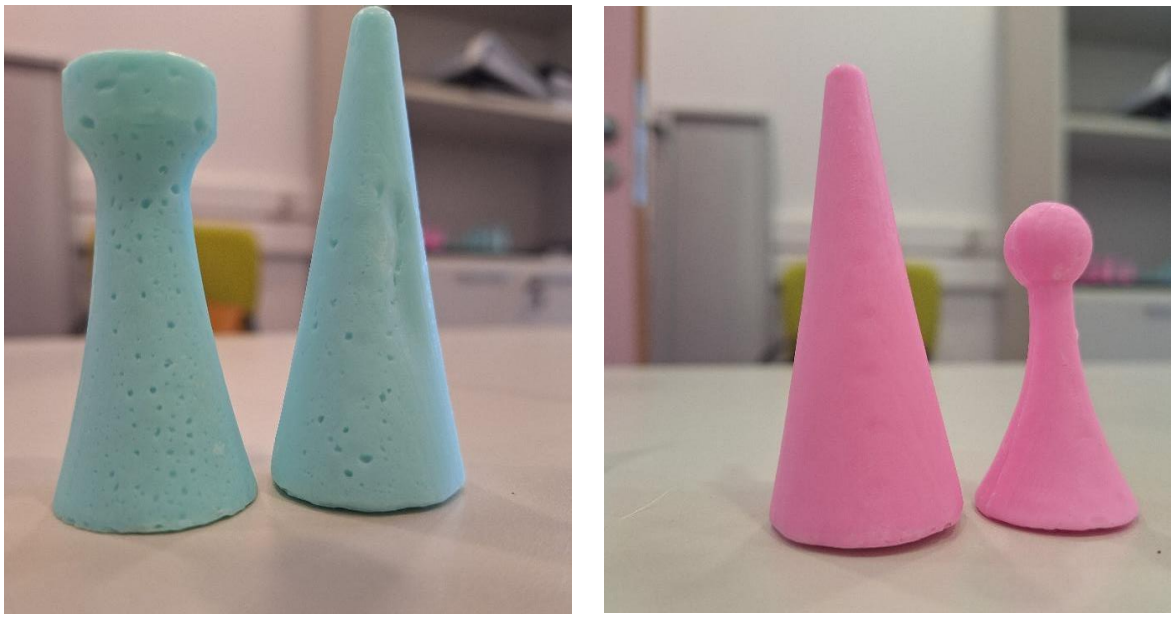


Figure 83. Left: the effect of bubbles. Right: Improved pieces manufactured in the colour and scent of choice.

Conditioning

Release behaviour varied across materials. Pressed solids (plasticine, clay) generally required mechanical care during extraction; cast materials (soap, wax) were sensitive to surface roughness and seam leakage.

Initially, the resulting pieces exhibited imperfections such as voids and minor visible inclusions. As a remedy, an isopropyl alcohol spray was applied to the mould, both before closure and into the cavity after the filling process. This technique effectively mitigated bubble formation, leading to a significant improvement in the final product. The application of the spray not only prevented effervescence but also contributed to a smoother surface texture.

Concurrently, to ensure the full detail of the mould was captured and to prevent voids, the mould was lightly tapped on the table for a few seconds immediately after the liquid soap was poured. This simple procedural step substantially enhanced the quality of the final product.

Observed/typical domestic strategies:

- Ensuring the mould is clean and dry before use
- Using a light release aid where appropriate (material-dependent)
- Avoiding geometries that mechanically lock into the mould (undercuts)
- Considering post-processing (light sanding/sealing) to reduce print-layer texture where it harms release

This simple but important movement ensured that the soaps would be demoulded easily and without sticking to the walls of the moulds.

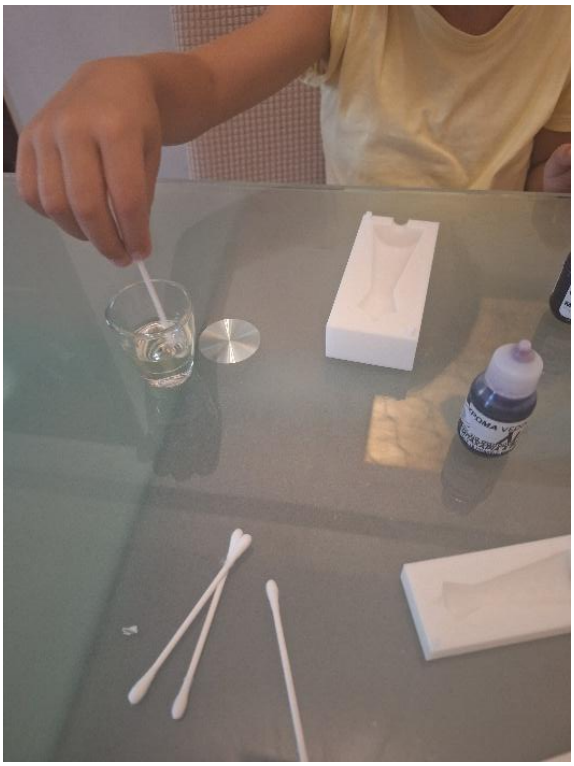


Figure 84. Conditioning the moulds with oil for easy release.

Occasionally, upon demoulding, it was observed that the soaps retained minor unwanted residue or excess material along the edges. This was attributable to an imperfect fit of the mould, which resulted in small leaks during the casting process. These imperfections were carefully removed using a knife or scissors to ensure the final pieces were clean and refined.

Demoulding: Geometry and Mould Topology

The chess pieces present geometric challenges, specifically undercuts, or features that lock a cast object into the mould.

- Bipartite moulds work for simple geometries but fail for complex shapes.
- Quadripartite moulds were utilised for more complex pieces that required multi-directional release.

This progression illustrates a key educational takeaway for the maker community: mould design is a lesson in topology. The move from two to four parts is not arbitrary but a geometric necessity dictated by the form.

Demoulding difficulty was primarily driven by mould topology and rigidity. Rigid, 3D-printed moulds perform best with:

- Draft angles and smooth transitions
- Clear parting lines (for two-part moulds)
- Minimal undercuts
- Adequate seam sealing (for casting)

Where complex geometry is required, a rigid printed mould may be better used as a master for producing a flexible secondary mould (e.g., silicone), rather than as the direct production mould.

Figure 85. Unmoulding the finished soap chess pieces from two (left) and four-piece moulds (right).

F.1.5. Result

Overall, the domestic study demonstrated that 3D-printed moulds can support both pressing and casting activities at home, especially for simple geometries and materials with forgiving handling characteristics.

Key observations:

- Pressing (plasticine/clay): generally robust and low-risk; good for rapid experimentation and form exploration.
- Casting (soap/wax): feasible but more sensitive to process control (temperature, sealing, bubbles).
- Surface quality: influenced by print texture and seam lines; fine detail is achievable but depends on flow and bubble management.
- Usability: Two-part moulds require careful alignment and sealing to prevent leakage.

In alignment with Craeft's mission, the chess demonstrator demonstrates how traditional forms can be reimagined through contemporary fabrication methods, producing outcomes that are educational, playful, and culturally resonant. It affirms that familiar cultural objects, when combined with experimental making processes, can generate technical insights and public engagement.

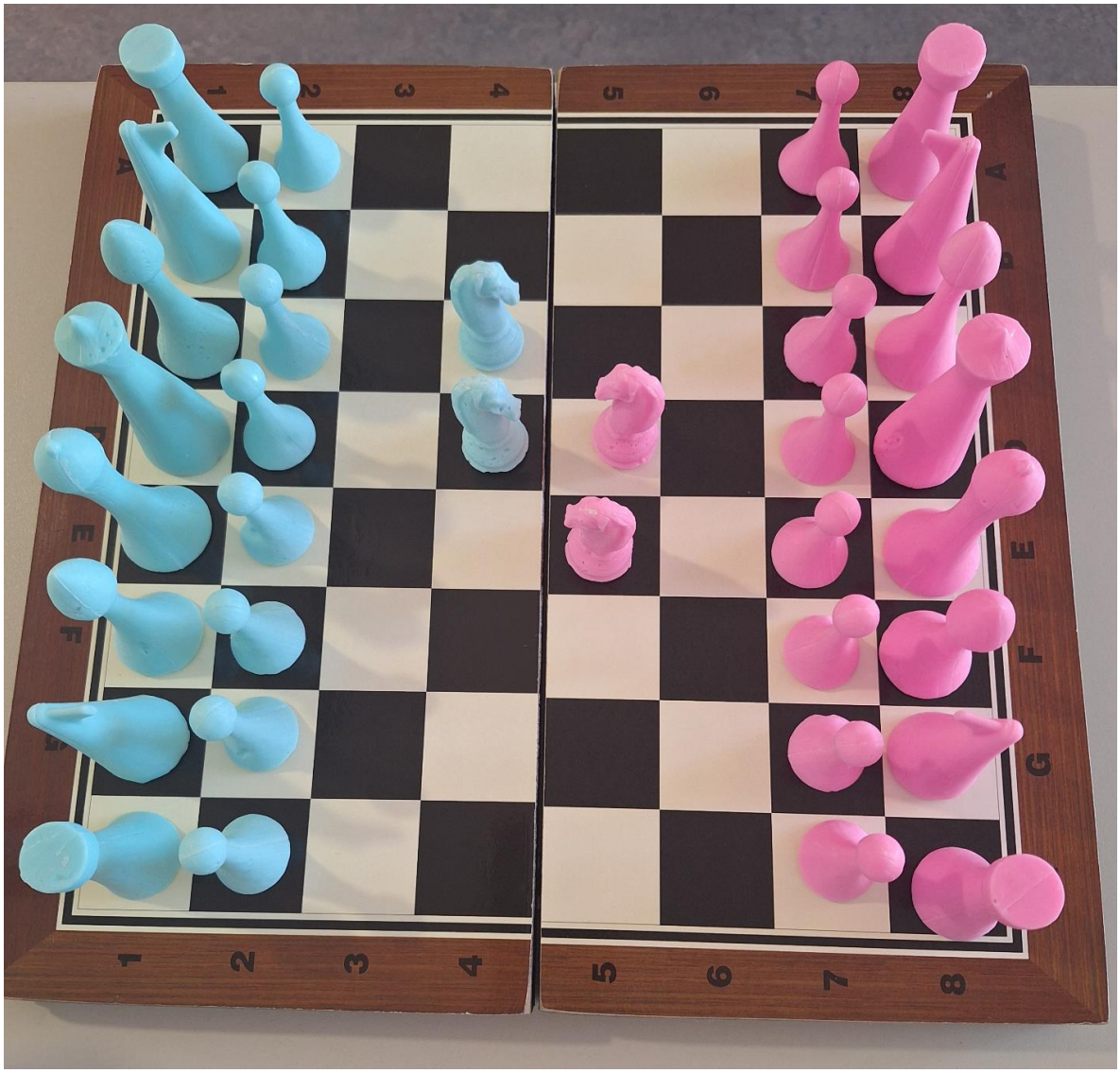


Figure 86. Completed soap chess pieces, ready for play.

F.2.6. Conclusions

This domestic exploration supports the use of 3D-printed moulds as accessible craft tools, with clear practical constraints that should be communicated in maker-facing guidance.

Conclusions and recommendations

- Rigid 3D-printed moulds are most reliable for simple shapes with draft and minimal undercuts.
- Pressing workflows are the easiest entry point for domestic making and education activities.
- Casting workflows require guidance on temperature control, seam sealing, and bubble mitigation.
- For food-related casting (e.g., chocolate), direct use of typical 3D-printed plastics is not recommended without an appropriate food-safe workflow; a safer approach is to use the print as a master to create a certified food-safe secondary mould.

F.2 Moulding Glossary

Table 28. Semantic Framing (AAT). See also Annex E.

Process	Moulding (nipping)	Casting
Control	filling	pouring
Material	clay, plasticine (moulding material)	wax, soap
Actions	pressing and, sometimes, drying	melting and solidification
Cause	force, pressure	force, heat
Tools	pressing machines	melting pots, casting moulds

- Plasticine: Too malleable, resulting in distorted shapes upon demoulding.
- Clay: Unstable at the seam line when joining halves, producing unsatisfactory results.
- Soap: Highly successful after adjustments. Oiling, alcohol spray, and tapping significantly improved outcomes. A full soap chess set was produced with detailed, consistent pieces.
- Candle Wax: Early trials suggest promising results, raising the possibility of a complete candle chessboard.

The contrast reveals that casting is better suited for detailed and consistent results. Moulding is quicker but imperfect. Through trial and error, the soap-based experiment demonstrated that 3D-printed moulds can reliably produce intricate and durable artefacts using only household resources.

F.2.1 Tools

- Pressing machines - http://vocab.getty.edu/page/aat/300430790.
- Melting pots - http://vocab.getty.edu/page/aat/300417959. Heating equipment.
- Casting moulds - http://vocab.getty.edu/page/aat/300422800. Shaping equipment. Forms into which liquid or molten substances are poured to take shape as they harden.

F.2.2 Materials

- Moulding material - http://vocab.getty.edu/page/aat/300015153. Any material designed for or used to fill moulds.
- Clay - http://vocab.getty.edu/page/aat/300010439.
- Plasticine - http://vocab.getty.edu/page/aat/300266336. A soft, plastic, non-drying, claylike substance, used for modelling.
- Wax - http://vocab.getty.edu/page/aat/300014585.
- Soap - http://vocab.getty.edu/page/aat/300014329.

F.2.3 Actions

- Forming - http://vocab.getty.edu/page/aat/300053098. Shaping, moulding, or fashioning into a certain state or condition.
- Pressing - http://vocab.getty.edu/page/aat/300053136. Forming by means of pressure, especially a steady, overall pressure.

- Moulding - http://vocab.getty.edu/page/aat/300053134. Giving form to something by use of a mould.
- Nipping - http://vocab.getty.edu/page/aat/300261403. Applying heavy pressure to something between two surfaces for a brief period. This is a subclass of pressing, but not entirely precise for our case.
- Casting - http://vocab.getty.edu/page/aat/300053104. Shaping by pouring a liquid or molten substance into a mould where it hardens.
- melting - http://vocab.getty.edu/page/aat/300186835
- solidification - http://vocab.getty.edu/page/aat/300380198
- filling - http://vocab.getty.edu/page/aat/300053092. Inserting material into a hole, crack, or cavity.
- Pouring - http://vocab.getty.edu/page/aat/300250952. Causing a liquid, fluid, or anything in loose particles to flow or fall.
- Drying - http://vocab.getty.edu/page/aat/300053758. Making free or nearly free of liquids.

F.2.4 Physical Entities

- Energy - http://vocab.getty.edu/page/aat/300056007. The capacity to do work. Any quantity with dimensions that can be represented as mass times length squared divided by time squared.
- Force - http://vocab.getty.edu/page/aat/300056017 - Interaction that changes motion or causes deformation; agency or influence that, if applied to a free body, results chiefly in an acceleration of the body and sometimes in elastic deformation and other effects.
- Pressure - http://vocab.getty.edu/page/aat/300056048 Exertion of force per unit area.
- Heat - http://vocab.getty.edu/page/aat/300056020 Energy in the process of transfer between a system and its surroundings as a result of temperature differences.

Annex G. Cultural Tourism Promotion DIY Platform

This is a web-based platform built with React that promotes cultural tourism activities across a geographical region. Users can explore events, plan trips, view activity locations on a map, and read about the cultural significance of a place.

G.1 Contents

The small website created by default features the pages reported in the table below.

Table 29. Website structure

Navigation		
Homepage	Immediate user engagement and spotlight key offerings.	Featured activities and events.
About	Provide context and background.	Explanations of historical and cultural importance.
Events		
Exploration	Allow users to discover and explore events.	Event cards display title, image, date, and location.
Event & Pages	Provide geographical context for events.	A Leaflet-based map showing event locations via pins.
Personalisation, Trip Planner		
Trip Planner	Allow users to save and organise their visits.	Functionality for adding events to a personal itinerary.
Community		
User Experiences	Build trust and provide real-world feedback.	User testimonials and shared experiences.

G.2 Data Schema

Each entry is an event object with multilingual fields. Each entry corresponds to an event and determines a few key pieces of information about the event. The data are captured via Google Forms → saved as sheet.csv → and transformed by csv_to_json.py into public/data/events.json with bilingual fields and coordinates parsing. Translation uses Google Translate (network access likely required). Each entry is encoded as a data tuple with the following elements.

Table 30. Data Schema

Field Name	Data Type	Description
title	string	Title (Greek)
title_en	string	Title (English)
date	string	Date (dd/mm/yyyy)
location	string	Location (Greek)
location_url	string	Location URL (Google Maps link)
description	string	Description (Greek)
description_en	string	Description (English)
image	string	Image (relative path)
lat	number	Latitude
lng	number	Longitude

G.3 Software Implementation

From a technical perspective, the platform combines a ReactJS front-end with supporting modules for navigation (React Router), styling (Tailwind CSS), and geospatial rendering (React Leaflet with OpenStreetMap). Dynamic data are supplied through a Python script (csv_to_json.py) that converts input from Google Forms (stored as CSV) into structured JSON files. This workflow enables local organisers to submit events directly, while the system ensures that the information is rendered consistently in the interface. Multilingual support is achieved through the i18next library, allowing all pages to be displayed in Greek and English.

G.4 Dependencies

The table summarises the key technical dependencies for the application.

Table 31. Dependencies

React	*Framework*	The core JavaScript library for building the user interface (UI).
React Leaflet	*Mapping*	Provides an interactive map interface using the Leaflet library (often used with OpenStreetMap).
React Router	*Navigation*	Enables client-side routing for navigation between different pages/views.
Vite	*Tooling*	A modern build tool that serves the development environment and bundles assets for production.
Tailwind CSS	*Styling*	A utility-first CSS framework used to design the application's look and feel.
18next	*Globalisation*	A comprehensive internationalisation framework for handling multiple languages.

G.5 Repository Contents

Table 32. Repository Contents

File/Folder	Description	Role
Code & Configuration		
`package.json`	Defines project dependencies, metadata, and build scripts.	Project Setup
`tailwind.config.js`	Configuration file for the Tailwind CSS framework.	Styling Setup
`src/`	Contains all core application code, including React components and pages.	Core Application
`locales/`	Stores localisation files for different languages (Greek el, English en).	Language, Content
Data & API		
`scripts/sheet.csv`	The primary source data file.	Source Data

data/events.json	The derived data file is consumed by the application.	Application API Data
Media Assets		
data/photos/	Directory for all image assets (optional; default thumbnails shown if not provided).	Static Media
Automation		
scripts/csv2json.py	Python script to convert data from CSV to JSON. Dependencies: Utilises Pandas for data handling and Google Translate for various cases (e.g., translation/localisation during conversion).	Data Processing Script Dependencies

G.6 Usage commands

Make sure you have Node.js and Yarn installed.

1. Clone the Repository

```
git clone https://github.com/Kleomen/Thesis-Cultural-Tourism-Activities.git
```

cd Thesis-Cultural-Tourism-Activities

2. Install Dependencies

```
yarn install
```

3. Start the Development Server

```
yarn start
```

G.7 Rhodes experiment data

Cultural Tourism Platform – Rhodes (prototype codebase, dynamic data, and media)

A working prototype of a cultural-tourism web platform for Rhodes. It integrates a React front end, multilingual resources, an open-map layer (Leaflet/OpenStreetMap), and a Python pipeline that converts event submissions (Google Forms → CSV) into a structured events.json used by the UI.

Name: Craeft – Rhodes Cultural Events (student pilot)

Source file: events.json

Geography: Rhodes, Greece (≈ lat 36.2–36.5, lng 27.8–28.3)

Temporal coverage: June–August 2025

License: CC BY 4.0 for metadata, separate rights for images.

G.8 Dataset

G8.1 Rhodes Dataset tree

```
project/
├── .gitignore
├── README.md
├── package.json
├── public/
│ ├── index.html
│ ├── manifest.json
│ ├── data/
│ │ └── events.json
│ └── photos/ # image assets (e.g., *.jpg, *.avif)
├── scripts/
│ ├── csv_to_json.py # CSV→JSON converter (uses pandas, googletrans)
│ └── sheet.csv # source data from Google Forms
├── src/
│ ├── App.jsx, index.js, index.css
│ ├── components/ # NavBar, Slider
│ ├── locales/ # el.json, en.json
```

```
| └── pages/ # Home, AboutRhodes, Activities, Maps, PlanYourTrip,
Experiences

├── tailwind.config.js

└── yarn.lock
```

G8.2. Dataset/Software artefact description

Title

Cultural Tourism Platform – Rhodes (prototype codebase, dynamic data, and media)

Summary

A working prototype of a cultural-tourism web platform for Rhodes. It integrates a React front end, multilingual resources, an open-map layer (Leaflet/OpenStreetMap), and a Python pipeline that converts event submissions (Google Forms → CSV) into a structured events.json used by the UI.

Contents

- **Code & config: package.json, tailwind.config.js, src/ (React components and pages), locales/ (el/en).**
- **Data: scripts/sheet.csv (source), public/data/events.json (derived).**
- **Media: public/photos/ (image assets referenced by events and UI).**
- **Scripts: scripts/csv_to_json.py (CSV→JSON; depends on pandas and googletrans).**

Data model

(events.json schema)
Each record contains:

- **title, description (Greek), title_en, description_en (auto-translated English)**
- **date (DD/MM/YYYY)**
- **location, location_url**
- **image (relative path under public/photos/)**
- **lat, lng (floats)**

Provenance & processing

Event rows are captured via Google Forms → saved as sheet.csv → transformed by csv_to_json.py into public/data/events.json with

bilingual fields and coordinates parsing. Translation uses Google Translate (network access likely required).

Execution

1. yarn install (or npm install)
2. (If sheet.csv changes) python scripts/csv_to_json.py
3. yarn start for dev; yarn build for production.

Dependencies

React, React Router, Tailwind CSS, Leaflet/React-Leaflet, i18next/react-i18next; Python 3 with pandas, googletrans.

G8.3. Manifest

```
# Rhodes Cultural Tourism Platform – Dataset & Software Artefact Manifest

## Title

Rhodes Cultural Tourism Platform (Prototype) – Codebase, Dynamic Data, and Media

## Summary

This package contains a working prototype of a cultural tourism platform for Rhodes.

It includes source code (React), localisation files, a data generation script (Python) that converts CSV input from Google Forms into JSON, and media assets used by the web UI.

## Contents

- `package.json`, `yarn.lock`, `tailwind.config.js`: build & styling configuration

- `public/`:

 - `index.html`, `manifest.json`: CRA shell

 - `data/events.json`: dynamic events generated from `scripts/csv_to_json.py`

 - `photos/`: image assets used by the UI

- `src/`:
```

```
 - `App.jsx`, `index.js`, `index.css`: app bootstrapping

 - `components/`: NavBar, Slider

 - `pages/`: Home, AboutRhodes, Activities, Maps, PlanYourTrip,
Experiences

 - `locales/el.json`, `locales/en.json`: i18n text resources

- `scripts/`:

 - `csv_to_json.py`: converts `scripts/sheet.csv` →
`public/data/events.json`

## Event JSON Schema

Each item in `public/data/events.json` has:

```json

{

 'title': 'Greek title',

 'title_en': 'English title',

 'date': 'DD/MM/YYYY',

 'location': 'Place name (GR)',

 'location_url': 'Google Maps URL',

 'description': 'Greek description',

 'description_en': 'English description',

 'image': 'relative path under public/photos',

 'lat': 36.1234,

 'lng': 28.1234

}

```

Rebuild Instructions

1. Install dependencies: `yarn install` (or `npm install`)
```

```
2. If CSV has changed:

 - Place the latest `sheet.csv` under `scripts/`

 - Run the converter: `python scripts/csv_to_json.py`

3. Start dev server: `yarn start` (or `npm start`)

4. Build production artefacts: `yarn build`

## Dependencies

- React, React Router, Tailwind CSS

- Leaflet / React Leaflet (OpenStreetMap tiles)

- i18next / react-i18next for localisation

- Python 3 with `pandas` and `googletrans` for CSV→JSON; note:
`googletrans` performs live translation and may require internet
access.

## Licence

Specify project and media licences here (e.g., MIT for code, CC BY for
text, rights for images).

## Citation

If you cite this artefact:

- Author: Student researcher (name), Supervisor(s)

- Year: 2025

- Title: Rhodes Cultural Tourism Platform (Prototype)

- URL/DOI: (to be added)

- Version: 1.0
```

Annex H. Retail support

H.1 Computer Vision Dataset Evaluation

We present the results of our system in identifying objects within our datasets. To evaluate the accuracy of the different neural networks that we use, we utilise quantitative performance metrics. These metrics allow us to assess the effectiveness of the models and to determine which objects are most accurately recognised.

See Annex CE1

H1.1 Woven Dataset

The testing of this dataset was conducted in two distinct phases. In the first phase, each item was represented by a single high-resolution image, which was then compressed to 25% of its original size. We then attempted to identify all 161 images of the items to evaluate the models' ability to recognise them and determine the conditions that best support our application. In the second phase, approximately 20 images per item were used as the training dataset, while the remaining images were reserved for testing.

For the results below, we use EfficientNet-B3.

Firstly, we observe that in the first phase, using a smaller dataset composed of higher-quality images, our model achieved an average Precision between 0.66 and 0.68, a Recall of 0.63 and an F1-score of 0.64. Although the training dataset consisted of high-quality images, the limited number of samples appears to have constrained the model's performance, preventing it from achieving higher accuracy.

Table 33. Evaluation Metrics: First Phase

Class	Precision	Recall	F1-Score	Support
green-flower-red bg	0.68	0.70	0.69	46
orange-green-pink	0.57	0.66	0.61	38
pink-black	0.51	0.57	0.54	44
red-cape	0.95	0.61	0.74	33
Accuracy			0.63	161
Macro avg	0.68	0.63	0.64	161
Weighted avg	0.66	0.63	0.64	161

Secondly, we observe that in the second phase, using a larger dataset of images with greater variety and more diverse views of the object significantly improved the model's performance. The average precision increased to 0.90, the average Recall reached approximately 0.90-0.91, and the average F1 score rose to 0.90.

Table 34. Evaluation Metrics: Second Phase

Class	Precision	Recall	F1-Score	Support
green-flower-red bg	0.90	0.83	0.86	46
orange-green-pink	0.86	0.95	0.90	38
pink-black	0.93	0.91	0.92	44
red-cape	0.91	0.94	0.93	33
Accuracy			0.90	161
Macro avg	0.90	0.91	0.90	161
Weighted avg	0.90	0.90	0.90	161

H1.2 Koumoulia Dataset

For the results below, we use EfficientNet-B3. With the Koumoulia Dataset, our model achieved an average Precision between 0.93 and 0.99, a Recall between 0.88 and 0.94 and an F1-score of 0.94.

Table 35. Classification Report for the Koumoulia Dataset

Class	Precision	Recall	F1-Score	Support
black-vase	1.00	0.90	0.95	10
blue-vase-face	1.00	1.00	1.00	7
macaroni-vase	1.00	1.00	1.00	10
man-doll	1.00	0.38	0.55	8
matcha	1.00	0.86	0.92	7
mitato	1.00	1.00	1.00	7

nNapolismall	0.83	1.00	0.91	10
necklace-aromatherapy	1.00	1.00	1.00	12
oil-burner	1.00	1.00	1.00	6
Oslo	1.00	1.00	1.00	9
red-vase-face	1.00	1.00	1.00	5
small-face-flower-pot	1.00	1.00	1.00	8
small-house-lantern	1.00	1.00	1.00	7
soap-dish	1.00	1.00	1.00	6
sous-verre	1.00	1.00	1.00	6
woman-doll	0.00	0.00	0.00	0
Accuracy			0.94	118
Macro Avg	0.93	0.88	0.90	118
Weighted Avg	0.99	0.94	0.95	118

H1.3 Dataset Evaluation

The created scenario involves a user at an exhibition who has already downloaded the mobile application. The exhibition manager has pre-loaded the application's dataset with information about all the artefacts.

The user's interaction with the app proceeds as follows:

1. Initial Scan: The user opens the application, uploads the dataset (if necessary, though the text implies the manager sent it and the user uploads it), and uses the in-app camera to scan an artefact.
    - If the app correctly recognises the item, the user views detailed information on the item's dedicated page.
    - If the recognition is inaccurate, the user uses the provided QR code to quickly access the correct information.
2. Gallery Upload: The user then chooses to upload a photo of another artefact, which is saved in their smartphone's gallery, instead of using the camera for live scanning.

3. Misrecognition and Resolution: In a final test case, the application incorrectly recognises the artefact from the gallery upload. The user resolves this misrecognition by scanning the item's QR code to ensure they access the correct information.

The study involved five participants (one female, four males) who completed the scenario using the mobile application. Three participants had moderate experience with similar systems, and two were experts. The average scenario completion time was approximately 5.5 minutes. Notably, no help was requested, and only one minor error occurred when a participant briefly navigated to the incorrect QR Scanner tab before quickly self-correcting. After completing the scenario, participants finished the evaluation tables and the SUS questionnaire. They then answered open-ended questions to provide comprehensive feedback on the mobile application.

The SUS score is calculated by summing the contributions of the 10 questions: (response - 1) for odd-numbered questions and (5 - response) for even-numbered questions. This sum is then multiplied by 2.5 to yield the final score, which ranges from 0 to 100 and represents the overall system usability.

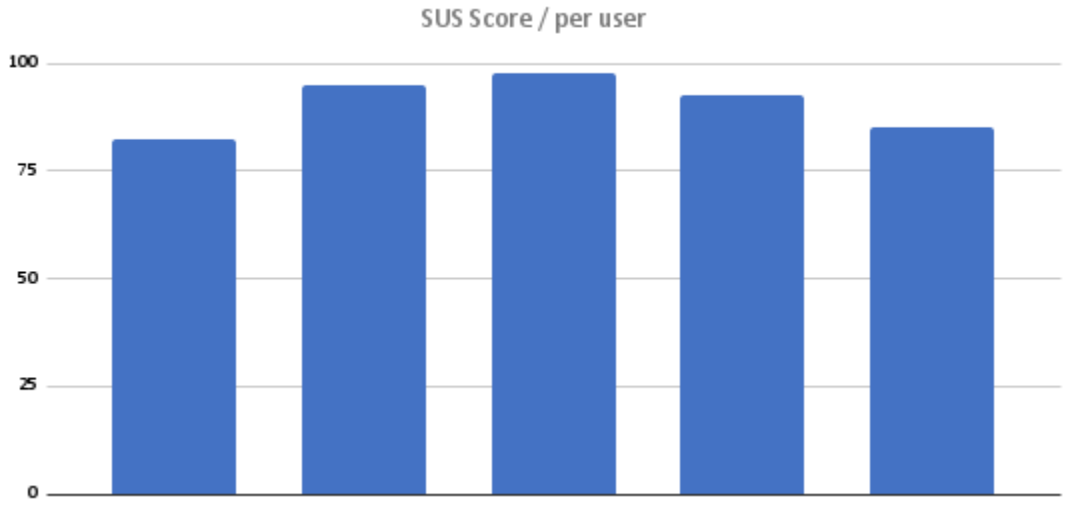


Figure 87. SUS Answers & Scores

The mobile application achieved a high average System Usability Scale (SUS) score of 90.5 out of 100. This score is significantly higher than the typical benchmark of 68, indicating that users found the application to be easy, simple, and enjoyable to use, as further evidenced by their subsequent answers. The majority of participants rated the application between 92.5 and 97.5, with the minimum score being 82.5. The stability of responses to the SUS questionnaire, with scores remaining within a narrow range (as shown in the figures above), demonstrates a consistently shared positive user experience.

H.2 Retail Questionnaire

H.2.1 English

The user visits an exhibition of objects and has downloaded the application on his mobile phone. The curator of the exhibition has already sent the dataset with all the objects in the collection.

Scenario 1

- The user opens the application and 'uploads' the dataset.
- He then uses his cell phone camera to identify one of the exhibits.
- If the application correctly recognises the object and the user confirms it, they are taken to the object's page to see detailed information. If the identification is not correct, it can scan the object's QR code to gain direct access to its information.

Scenario 2

- The user has a photo of another object from the same dataset stored on his mobile phone.
- This time, he chooses to upload the photo instead of using the real-time camera. The app recognises the object from the image and displays the option for the user to see information about it.

Scenario 3 - False Item

The user proceeds to identify an object. This time, however, the application outputs the wrong object.

So, to see information about the object he wants, the user decides to scan the object's QR code.

Evaluation Tables

Evaluation start time:	10:54	
Evaluation end time:	11:00	
User:	#1	
Gender:	Male	Female
Experience with similar systems:	Moderate	Advanced/Expert
Number of help requests	Got a bit confused on the upload with the buttons, opened QR instead of Recognise for recognition.	

Number of errors	0
What do you think of the system in general? instant recognition and QR Would you use it? It's not related to her work, but for recognition, fine What did you have the most difficulty with? Better organisation of buttons, such as upload dataset with the two buttons next to each other What did you like above? Recognition is fast and simple Was there anything you didn't like and would like to change? Better organisation of buttons, such as upload dataset with the two buttons next to each other Was there a feature or function you wished were there but couldn't find? capability for multiple datasets Do you have anything else to add?	

Evaluation start time:	11:10	
Evaluation end time:	11:15	
User:	#2	
Gender:	Male	Female
Experience with similar systems:	Moderate	Advanced/Expert
Number of help requests	0	

Number of errors	0
What do you think of the system in general? nothing superfluous Would you use it? Yes What did you have the most difficulty with? waiting for dataset upload What did you like above? certainty for every movement, fast recognition time Was there anything you didn't like and would like to change? more attractive interface(design) Was there a feature or function you wished were there but couldn't find? micro recognition history Do you have anything else to add?	

Evaluation start time:	11:29	
Evaluation end time:	11:35	
User:	#3	
Gender:	Male	Female
Experience with similar systems:	Moderate	Advanced/Expert
Number of help requests	0	

Number of errors	0
What do you think of the system in general? nice, usable Would you use it? In exhibitions and corresponding spaces, yes What did you have the most difficulty with? nothing What did you like above? You enter whatever information you want, your own datasets Was there anything you didn't like and would like to change? that the image you took/uploaded existed Was there a feature or function you wished were there but couldn't find A way through the application to be able to create the dataset Do you have anything else to add?	

Evaluation start time:	11:49	
Evaluation end time:	11:55	
User:	#4	
Gender:	Male	Female
Experience with similar systems:	Moderate	Advanced/Expert
Number of help requests	0	
Number of errors	0	

What do you think of the system in general? Fine for a museum exhibition, convenient for additional information Would you use it? not daily What did you have the most difficulty with? nothing special, the eye did not easily go down to the bar, the bar is more distinct What did you like above? Pretty good picture Was there anything you didn't like and would like to change? what they suffered above Was there a feature or function you wished were there but couldn't find? somehow integrate with the mobile camera Do you have anything else to add?

Evaluation start time:	12:09	
Evaluation end time:	12:14	
User:	#5	
Gender:	Male	Female
Experience with similar systems:	Moderate	Advanced/Expert
Number of help requests	0	
Number of errors	0	

What do you think of the system in general?

simple, useful, for all ages

Would you use it?

in the right context

What did you have the most difficulty with?

The bottom tab was not distinct, and what I had selected

What did you like above?

Use the above methods, upload the dataset

Was there anything you didn't like and would like to change?

Select the camera and open it immediately

I am attaching information about what I do in each tab

Was there a feature or function you wished were there but couldn't find?

3d model, rotation in the application

Bullets are better for the item on its page

Do you have anything else to add?

H.2.2 Greek

Ο χρήστης επισκέπτεται μια έκθεση αντικειμένων και έχει κατεβάσει την εφαρμογή στο κινητό του. Ο υπεύθυνος της έκθεσης έχει ήδη αποστείλει το dataset με όλα τα αντικείμενα της συλλογής.

Scenario 1

- Ο χρήστης ανοίγει την εφαρμογή και 'ανεβάζει' το dataset.
- Στη συνέχεια, χρησιμοποιεί την κάμερα του κινητού του για να αναγνωρίσει ένα από τα εκθέματα.
- Αν η εφαρμογή αναγνωρίσει σωστά το αντικείμενο και ο χρήστης το επιβεβαιώσει, μεταφέρεται στην σελίδα του αντικειμένου για να δει αναλυτικές πληροφορίες. Αν η αναγνώριση δεν είναι σωστή, μπορεί να σαρώσει το QR code του αντικειμένου ώστε να αποκτήσει άμεση πρόσβαση στα στοιχεία του.

Scenario 2

- Ο χρήστης έχει αποθηκευμένη στο κινητό του μια φωτογραφία ενός άλλου αντικειμένου από το ίδιο dataset.
- Αυτή τη φορά επιλέγει να ανεβάσει τη φωτογραφία αντί να χρησιμοποιήσει την κάμερα σε πραγματικό χρόνο. Η εφαρμογή αναγνωρίζει το αντικείμενο από την εικόνα και εμφανίζει την επιλογή να δει ο χρήστης πληροφορίες για αυτό.

Scenario 3 - False Item

- Ο χρήστης προχωράει στην αναγνώριση ενός αντικειμένου. Αυτήν την φορά όμως βγάζει λάθος αντικείμενο η εφαρμογή.
- Έτσι για να δει πληροφορίες για το αντικείμενο που θέλει, ο χρήστης αποφασίζει να σκανάρει το QR code του αντικειμένου.

Evaluation Tables

Evaluation start time:	10:54	
Evaluation end time:	11:00	
User:	#1	
Gender:	Male	Female
Experience with similar systems:	Moderate	Advanced/Expert
Number of help requests	0	
Number of errors	1 μπερδεύτηκε λίγο στο upload με τα κουμπιά, άνοιξε το QR αντί για το Recognise για αναγνώριση	
Τι γνώμη έχετε για το σύστημα γενικά; αμεση αναγνωριση και qr Θα το χρησιμοποιούσατε; δεν ειναι σχετικο με δουλεια της αλλα για αναγνωριση μια χαρα Με τι είχατε την μεγαλύτερη δυσκολία;		

καλυτερη οργανωση κουμπιων, οπως upload dataset με τα δυο κουμπια διπλα διπλα Τι σας άρεσε παραπάνω; αναγνωριση γρηγορη και απλη Υπήρχε κάτι που δεν σας άρεσε και θα θέλατε να αλλάξει; καλυτερη οργανωση κουμπιων, οπως upload dataset με τα δυο κουμπια διπλα διπλα Υπήρχε κάποιο χαρακτηριστικό ή λειτουργία που θα θέλατε να υπάρχει αλλά δεν την βρήκατε; δυνατοτητα για πολλαπλα dataset Έχετε κάτι άλλο να προσθέσετε;

Evaluation start time:	11:10	
Evaluation end time:	11:15	
User:	#2	
Gender:	Male	Female
Experience with similar systems:	Moderate	Advanced/Expert
Number of help requests	0	
Number of errors	0	
Τι γνώμη έχετε για το σύστημα γενικά; τιποτα περιττο Θα το χρησιμοποιούσατε; ναι Με τι είχατε την μεγαλύτερη δυσκολία;		

αναμονή upload dataset Τι σας άρεσε παραπάνω; βεβαιοτητα για καθε κινηση, γρηγορος ο χρονος αναγνωρισης Υπήρχε κάτι που δεν σας άρεσε και θα θέλατε να αλλάξει; πιο ελκυστικο interface(design) Υπήρχε κάποιο χαρακτηριστικό ή λειτουργία που θα θέλατε να υπάρχει αλλά δεν την βρήκατε; μικρο ιστορικο αναγνωρισης Έχετε κάτι άλλο να προσθέσετε;

Evaluation start time:	11:29	
Evaluation end time:	11:35	
User:	#3	
Gender:	Male	Female
Experience with similar systems:	Moderate	Advanced/Expert
Number of help requests	0	
Number of errors	0	
Τι γνώμη έχετε για το σύστημα γενικά; ωραιο, usable Θα το χρησιμοποιούσατε; σε εκθεσεις και χωρους αντιστοιχους ναι Με τι είχατε την μεγαλύτερη δυσκολία;		

τιποτα Τι σας άρεσε παραπάνω; καταχωρεις οτι πληροφορια θες, δικο σου datasets Υπήρχε κάτι που δεν σας άρεσε και θα θέλατε να αλλάξει; να υπηρχε η εικονα που εβγαλες/ανεβασεις Υπήρχε κάποιο χαρακτηριστικό ή λειτουργία που θα θέλατε να υπάρχει αλλά δεν την βρήκατε; μεσω της εφαρμογης να μπορει να φτιαξει το dataset Έχετε κάτι άλλο να προσθέσετε;

Evaluation start time:	11:49	
Evaluation end time:	11:55	
User:	#4	
Gender:	Male	Female
Experience with similar systems:	Moderate	Advanced/Expert
Number of help requests	0	
Number of errors	0	
Τι γνώμη έχετε για το σύστημα γενικά; για μουσειο εκθεση μια χαρα, βολικο για παραπανω πληροφοριες Θα το χρησιμοποιούσατε; οχι σε καθημερινη βαση Με τι είχατε την μεγαλύτερη δυσκολία;		

οχι κατι ιδιαιτερο δεν πηγε ευκολα το ματι κατω στην μπαρα, πιο distinct η μπαρα Τι σας άρεσε παραπάνω; αρκετα καλη εικονα Υπήρχε κάτι που δεν σας άρεσε και θα θέλατε να αλλάξει; αυτα που υποθηκαν παραπανω Υπήρχε κάποιο χαρακτηριστικό ή λειτουργία που θα θέλατε να υπάρχει αλλά δεν την βρήκατε; μηπως integrate με την καμερα του κινητου Έχετε κάτι άλλο να προσθέσετε;

Evaluation start time:	12:09	
Evaluation end time:	12:14	
User:	#5	
Gender:	Male	Female
Experience with similar systems:	Moderate	Advanced/Expert
Number of help requests	0	
Number of errors	0	
Τι γνώμη έχετε για το σύστημα γενικά; απλο, χρησιμο, για καθε ηλικια Θα το χρησιμοποιούσατε; στο σωστο context		

Με τι είχατε την μεγαλύτερη δυσκολία; δεν ηταν το κατω tab distinct , και τι εχω επιλεγμενο Τι σας άρεσε παραπάνω; παραπανω τροποι, upload dataset Υπήρχε κάτι που δεν σας άρεσε και θα θέλατε να αλλάξει; select camera και απευθειας να ανοιγε παραπανω πληροφορια για το τι κανω σε καθε tab Υπήρχε κάποιο χαρακτηριστικό ή λειτουργία που θα θέλατε να υπάρχει αλλά δεν την βρήκατε; 3d model, rotation στην εφαρμογή bullets καλύτερα για το αντικείμενο στη σελίδα του Έχετε κάτι άλλο να προσθέσετε;

H.2.3 Content collection form

Table 36. Content collection form

Categories	Name	Type	Comments
Object	Name of object	Text	
	Year of creation	Drop-down menu	
	Geographical location of creation	Latitude/Longitude	
	Description of object	Text	Anything the user wants; not all fields are mandatory
		Image	
		Video	
		Interactive video	
		Audio	

	Inspiration	Text	Anything the user wants; not all fields are mandatory
		Image	
		Audio	
	Craft	Drop-down menu	
	Techniques	Text or Drop-down menu	
	Materials	Text or Drop-down menu	
	Provenance of materials	Text or drop-down menu	Countries
	Tools/machines	Text or Drop-down menu	
	Description of making	Text	Anything the user wants; not all fields are mandatory
		Image	
		Video	
		Audio	
	Milestone(s) of making	Text	Highlight significant moment(s) while making; anything the user wants; not all fields are mandatory.
		Image	
		Video	
		Audio	
	Use and repair information	Text	anything the user wants; not all fields are mandatory
		Image	
		Video	
		Audio	
		Location and Contact details	If the maker provides this service or the shop has service collaborators

	Recycle information	Text	Instructions regarding how and where each material/part or whole of the object can be recycled.
	Reuse information	Text	indicate retail places of used objects
		Location	
	Certification (e.g. Geographical Indication, Authenticity, etc.)	Attach pdf	
Maker	Name of maker	Text	
	Role	Text	
	Year of birth	Drop-down menu	
	Geographical location of birth	Latitude/Longitude	
	Websites	Links	
	Educational background	Drop-down menu	Variety, not only formal education
	Know-how transmission	Drop-down menu	e.g. trainer, apprentice, etc.
	Background milestone(s) and certifications	Text	Highlight significant moments of engaging with craft; anything the user wants; not all fields are mandatory.
		Image	
		Attach pdf	
	Philosophy and Values	Text	
Shop	Name of shop	Text	
	Geographical location of the shop	Latitude/Longitude	

	Name of owner	Text	If the same as the Creator, use their info
	Local economy contribution	Text	
	How did you meet the maker?	Text	Applicable if the creator is not the seller
	<u>Environmental information</u>: ● Transportation to retail: aeroplane, vehicle, boat, train ● Transportation to the client (e-shop): aeroplane, vehicle, boat, train	Check the appropriate box for each relevant phase.	
	<u>Shipping information</u>: ● Season: Summer, Winter ● Packaging: plastic, paper, fabric, other (please specify)	Check the appropriate box for each aspect.	Outcome example: This item is shipped with a refrigerated courier service during the summer.
	<u>Seasonal information:</u> ● Christmas ● Easter ● Mother's Day ● Father's Day	Check the appropriate box.	

	<u>Occasion information:</u> ● Birthday ● Wedding ● Name day ● Relationship celebration ● Thought of you ● Souvenir	Check the appropriate box.	
	Staff recommendation	Check the box	Outcome example: our staff recommends this product!
	Customer testimonials	Text	

Annex I. Shine bright like silver APP design

Although the application supports both Greek and English, the wireframes displayed in this section present the English version for clarity.

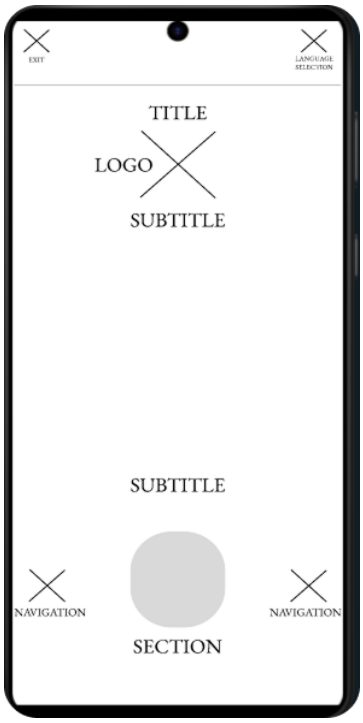


Figure 88. Main Menu – Wireframe of the Five Core Sections

The following wireframe presents the low-fidelity structure of the application's main menu. At this stage of the design, the goal was to define the placement and hierarchy of the five primary sections: *Techniques*, *Interactive Learning Material*, *Create an Object (Simulation)*, *Evaluate Us*, and *Settings*.

The wireframe focuses on layout rather than visual style, illustrating the positioning of the top navigation elements (exit button and language selector), the application title and logo, and the central navigation area containing the section buttons. No colours, backgrounds, icons, or stylistic details are included, as the purpose of this design step was to validate navigation flow, usability, and information structure before moving into visual mock-ups.

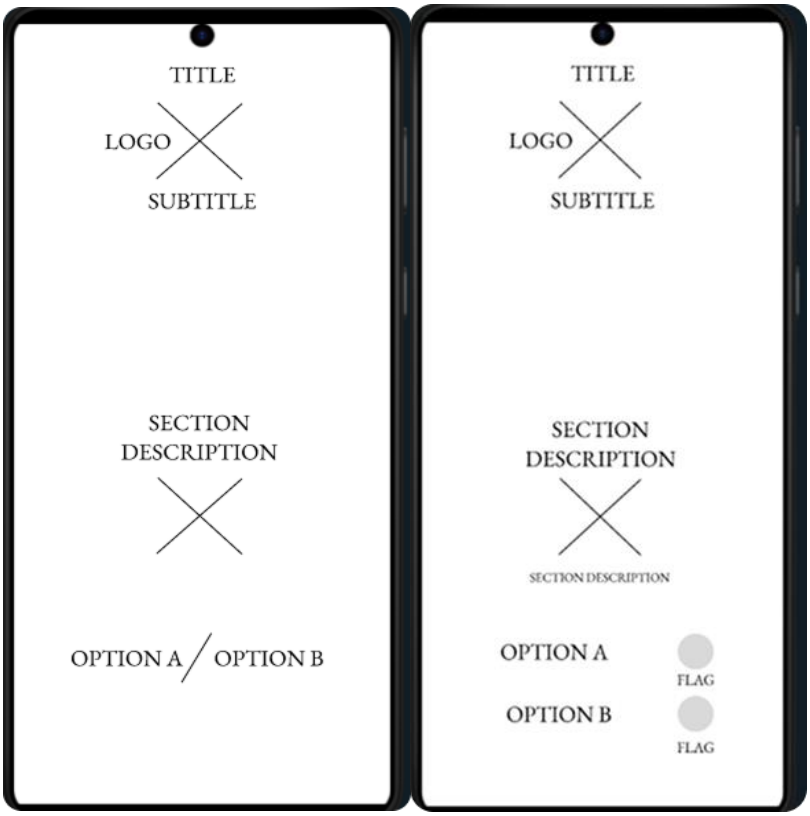


Figure 89. Wireframes for Utility Functions – Exit Confirmation & Language Selection

This figure presents the low-fidelity wireframes for the utility functions accessible from the main menu: the Exit Confirmation screen and the Language Selection screen. These wireframes outline the structural placement of core elements without applying any visual styling. The focus is purely on functionality and user flow.

In the Exit Confirmation wireframe, the layout displays the application title, logo and subtitle at the top, followed by a short section description and two selectable options ('Yes' / 'No') representing the user's choice.

In the Language Selection wireframe, the structure is similarly minimal, featuring the title, logo, and subtitle, followed by a short description and two available options ('English' and 'Greek'), each associated with a language indicator.

Figure 90. Wireframe – Station Selection (Techniques Museum Tour)

This is a low-fidelity wireframe illustrating the selection screen for the three exhibition stations (A, B, C). The wireframe shows the basic structure, including navigation buttons, section title, description area and selectable station panels. The purpose is to present the functional layout before applying visual styling in the mock-ups.

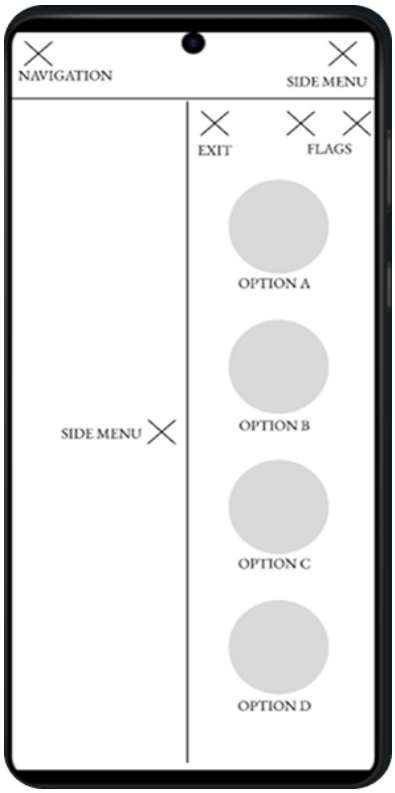


Figure 91. Wireframe - Side Menu / Quick Navigation Panel

The wireframe illustrates the structure of the side menu used for quick navigation across the application's main sections. In this low-fidelity representation, the focus is placed on layout and interaction logic rather than visual design. The screen includes the basic functional elements: a back navigation button, a side-menu toggle, an exit button, and language-selection controls. The central part of the wireframe displays the four primary navigation options, presented in a vertical list to ensure clarity and ease of access. This wireframe served as a structural guide for defining the behaviour and hierarchy of the quick-access panel during the implementation phase.

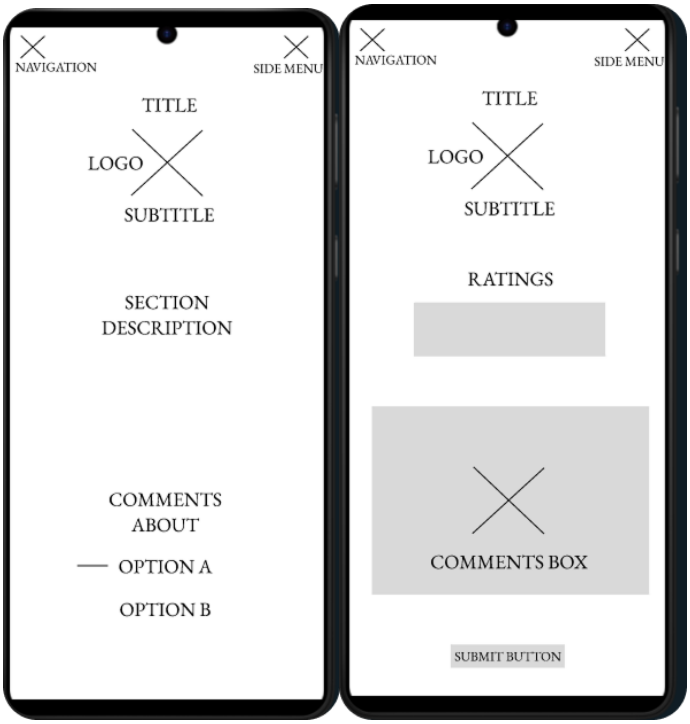


Figure 92. Evaluate Us Section Wireframes

The wireframes for the Evaluate Us section outline the structure of the feedback workflow before visual styling and implementation were applied. Two key screens are represented:

1. Feedback Category Selection Screen. This wireframe defines the introductory step where users choose whether they want to leave comments about (A) the Museum or (B) the Application Experience. Core UI elements include:
    - Header area with the title, museum logo and subtitle.
    - Navigation controls (Back arrow & Side Menu).
    - A short section description guiding the user.
    - Two clearly separated options, ensuring easy user decision-making.
2. Feedback Form Screen. After selecting a category, the user is taken to a structured feedback form. Its wireframe shows:
    - The header structure is identical to the previous screen for consistency.
    - A rating area (e.g., star system) to give an overall evaluation.
    - A large comments box allowing up to 250 characters for written feedback.
    - A Submit button is placed at the bottom for completion of the form.

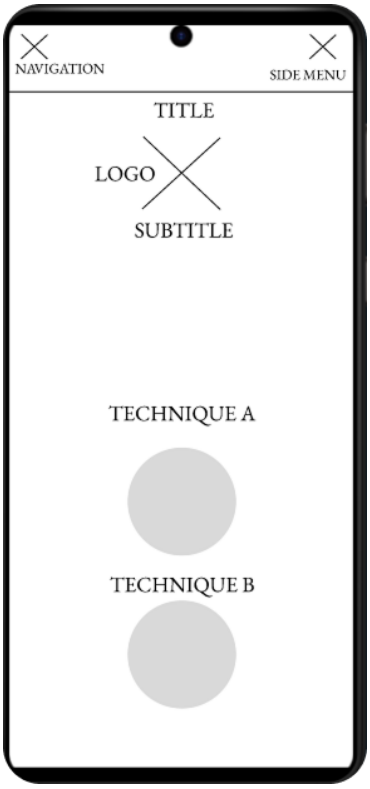


Figure 93. Interactive Learning Material – Wireframe

The wireframe for the Interactive Learning Material section outlines the initial layout through which users select one of the two available silversmithing techniques (Technique A and Technique B). At the top part of the screen, standard interface elements are included: a back navigation button on the left, a side-menu button on the right, the application title, the museum logo, and a short subtitle that introduces the section.

Below this header, the main interaction area presents two large circular buttons representing the techniques. These serve as the entry points to the corresponding mini-games and interactive learning content. The wireframe focuses on defining spatial structure, alignment, and the hierarchy of visual elements, without incorporating colours, textures, or iconography. Its purpose is to validate the simplicity of the interaction flow and ensure ease of access for users of all ages before moving on to the detailed visual mock-ups.

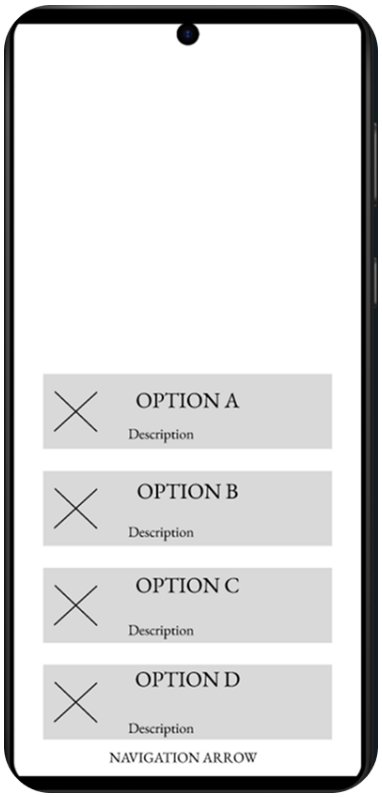


Figure 94. Settings Wireframe

The wireframe for the Settings section represents a simple, linear layout designed to present the application's informational and legal resources in a clear and accessible way. This screen functions as a credits and information hub, directing users to external websites for further details about the organisations involved in the project.

At the bottom half of the screen, four rectangular option blocks are displayed vertically, each containing a label and a short description. These blocks represent:

- Option A: Silversmithing Museum of Ioannina – About
- Option B: Piraeus Cultural Foundation – About
- Option C: Institute of Computer Science – Design & Development
- Option D: Terms & Conditions – For the use of the application

In the wireframe, each block includes a placeholder icon and a brief descriptive line, indicating the purpose of the option. In the final implementation, each selection opens the corresponding official website or, in the case of the Terms & Conditions, a dedicated informational page within the application.

A bottom navigation arrow indicates the option to return to the previous menu, maintaining consistency with the navigation structure used throughout the rest of the application.

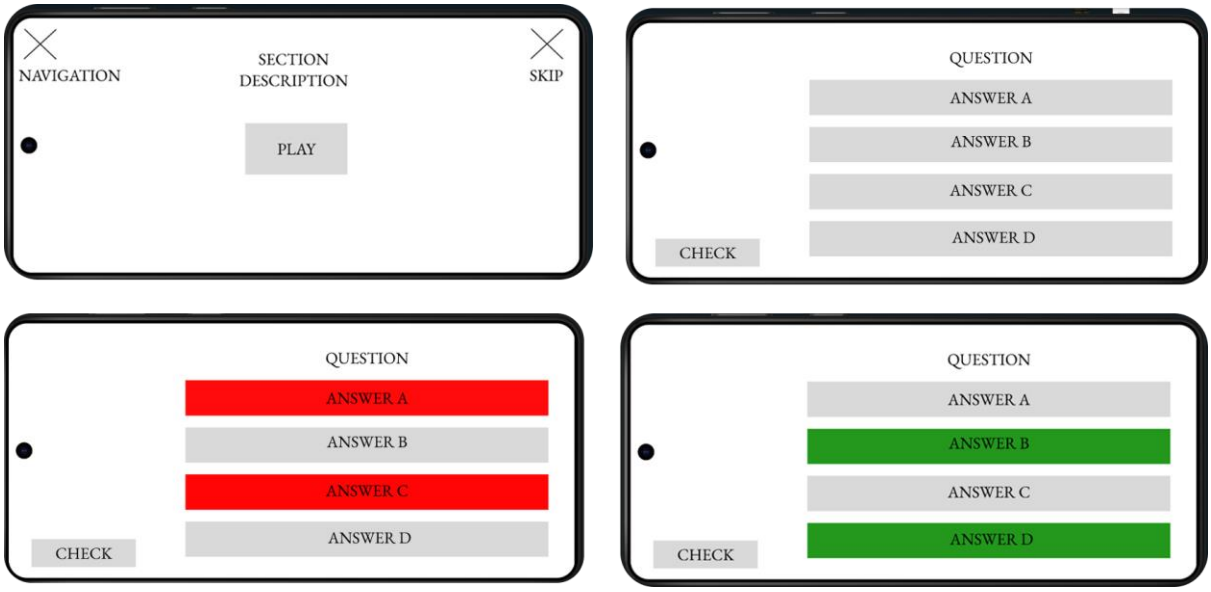


Figure 95. Interactive Video Wireframes

The following wireframes illustrate the planned structure and user flow of the interactive video activity included in the 'Shine Bright Like Silver' application. This activity supplements the Filigree technique by allowing users to watch a short instructional video and answer embedded questions to test their understanding.

The wireframes consist of four key stages:

Page A – Video Introduction Screen

This wireframe represents the introductory interface shown before the video begins. It includes:

- A Play button allowing the user to start the video.
- A Skip option enabling users to bypass the video and move directly to the questions.
- A Navigation arrow to return to the previous section. This page provides a minimal and clear layout, ensuring that users understand the purpose of the upcoming content.

Page B – Question Presentation Screen

After the relevant segment of the video finishes, a question appears as shown in this wireframe. The layout contains:

- A text area for the question.
- Four horizontally aligned answer options.
- A Check button is placed beneath the answers that allows the user to submit their response. This screen focuses solely on readability and simplicity to support effective learning.

Page C – Incorrect Answers Highlighting

This wireframe illustrates the immediate visual feedback when the user selects an incorrect option.

- Answer boxes turn red to indicate mistakes.
- Correct answers remain in their neutral (grey) state. The intention is to provide clear instructional feedback without overwhelming the user.

Page D – Correct Answers Highlighting

This wireframe shows how correct responses are indicated.

- Correct answers appear in green.
- Non-selected options stay in their neutral state.

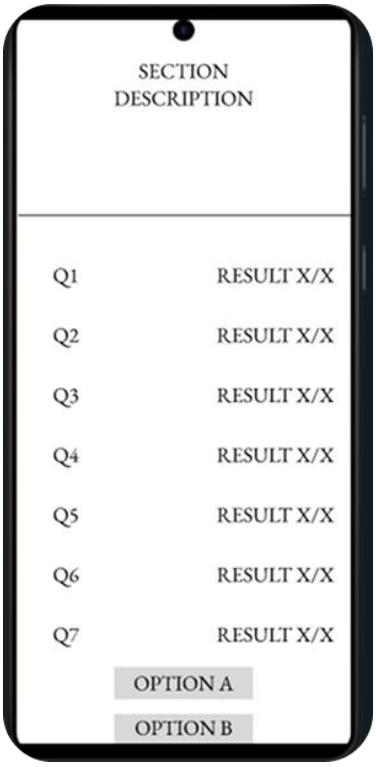


Figure 96. Interactive Video Results Wireframe

This wireframe illustrates the layout of the results screen that appears at the end of the interactive video activity. After the user finishes answering all questions, the application presents a summary screen listing each question (Q1–Q7) alongside its corresponding score in the format *X/X*, indicating how many attempts were answered correctly.

At the bottom of the wireframe, two action buttons are provided:

- Option A – Allows the user to rewatch the instructional video.
- Option B – Allows the user to proceed to the technique's interactive mini-games.

Figure 97. Interactive Games (Sand Cast & Filigree) Wireframe4

This figure presents the wireframe layout for the 'Interactive Games' section, which is shared across both the Sand Casting and Filigree techniques. At the top of the screen, the wireframe includes the standard navigation elements used throughout the application: a back arrow for returning to the previous screen and a side-menu icon for accessing global navigation shortcuts.

Beneath the header, the central title, museum logo, and subtitle establish visual hierarchy and maintain consistency with the application's design identity. This is followed by a section description that briefly explains the purpose of the interactive games.

The main content area displays a list of game buttons (GAME A, GAME B, GAME C, GAME D). These represent the available activities for each technique:

- Sand Casting uses this layout with three games,
- Filigree uses the same layout with four games.

At the bottom of the screen, an additional action button enables the user to return directly to the exhibition Stations, completing the interaction loop and reinforcing intuitive navigation.

The finalised wireframes provided the functional foundation for the Unity implementation phase. They acted as a detailed reference for developers regarding layout, hierarchy, and content flow, ensuring consistency between conceptual design and technical development.

Annex J. Interviews

J 1. Mobile Application, 'MNAD Limoges'

J.2. Cultural Tourism Experience, 'Textile Tour'

J.3. Atelier-Galerie interview

The experiment to promote artisanal products «Scannez-moi», which allows contextualisation of the product and access to information via a QR code, is carried out as part of the European project Craeft (Horizon 2022). In order to be able to evaluate this device, we are submitting a questionnaire.

1. What was your reception, the reception of your team, regarding this device?

2. What was the reception of the clientele?

3. Estimate of the number of people who visited the tourist office?

4. Did this have an impact on information requests and customer interest in the products?

5. In your opinion, did this have an impact on sales

6. What is the profile of your clientele during the summer period (Age, gender, CSP, geographical location, etc.)?

7. Did people fill out the satisfaction questionnaires?

8. What is your overall feedback?

9. Remarks and comments

J.4. VR glass blowing experience

J.4.1. Informal feedback with first group (10 July 2025)

1. How did you find the VR experience itself?
2. How did you find it?
3. Did you find the simulation of the environment and the gestures realistic/believable?
4. What did you like the most?
5. What did you like the least?

J.4.2. Interview with the second group (9 September 2025)

1. I would be interested to know how a tool like this could be useful in learning. What role could it play?
2. So you see it more as a training tool?
3. Otherwise, in terms of learning the process, does it seem interesting to you?
4. So you think someone could learn with VR? (referring to a learner who is afraid of fire)
5. There would need to be a back-and-forth process where they train in VR and then validate what they've learned in the workshop, through one or even several experiments. Do you agree?

J.5. Retail technological feedback

1. General impression
2. Willingness to use
3. Reported difficulties
4. Positive highlights
5. Suggested changes
6. Desired additional features
7. Any other comments

Annex K. Chess

K.1 Chess Market Survey

Chess occupies a singular position as a game of strategy and a cultural artefact. Its appeal is global, cutting across age, geography, and social class. Evidence of this popularity is found in several domains: online platforms host millions of daily matches; international tournaments attract federations from nearly every nation; and physical sets remain staples in households, schools, and cafés. What distinguishes the current moment is the convergence of tradition and technology. Streaming platforms and esports events have propelled chess into the digital spotlight, while series such as *The Queen's Gambit* have sparked renewed enthusiasm [85, 86]. The result is a landscape in which chess is simultaneously an ancient intellectual pursuit and a modern entertainment phenomenon.

In this sense, chess demonstrates how cultural practices adapt to new conditions while retaining their core identity. The enduring fascination lies in its blend of simplicity and depth: a finite set of rules gives rise to an infinite space of possibilities. Chess continues to attract newcomers while challenging seasoned players. Its popularity, therefore, is not merely a matter of numbers but a reflection of its unique capacity to evolve while maintaining continuity.

K1.1 Online Popularity

The digital era has transformed chess from a board game shared between two players into a global networked activity. Platforms such as Chess.com, with over 200 million registered members and more than 20 million games played daily, demonstrate the unprecedented scale of participation [84]. Millions of matches unfold daily, reflecting the volume of engagement and the accessibility of the medium. Lichess, with its open-source model, records millions of games each day, cultivating a strong community ethos that contrasts with the commercial orientation of other platforms [80]. Smaller arenas, including FIDE's official online platform, add further layers of competitive play, offering structured formats tied to the international federation.

What emerges from this constellation of platforms is a democratisation of access. Players once limited to local clubs now compete across continents, encountering a diversity of styles and skill levels that accelerate learning and support resilience. Importantly, the immediacy of digital play alters the rhythm of engagement. Whereas traditional chess often required deliberate planning of time and place, online environments invite casual encounters and rapid experimentation, thereby expanding the game's reach into everyday life.

K1.2 Competitive Chess and Esports

At the elite level, chess is institutionalised through FIDE, which unites more than 200 national federations and administers the world championship cycle [75]. These events serve as benchmarks of excellence, where preparation, psychological endurance, and cultural prestige converge. The traditional tournament structure is in continuity with the game's long institutional history, while still allowing for innovation in format and presentation.

In parallel, chess has entered the domain of esports, a transition that reflects the game's adaptability to new media ecologies. Events such as PogChamps, which feature popular streamers and celebrities, have drawn audiences in the millions [87]. Here, the focus shifts from elite performance to entertainment and community engagement. The spectacle of well-known figures learning, struggling, and occasionally excelling at the game reframes chess as competitive and playful.

The coexistence of formal tournaments and esports events illustrates the dual identity of chess in the 21st century. On one hand, it remains a discipline of rigour, demanding years of study and dedication. On the other hand, it thrives as a cultural performance, amplified by streaming technologies and online audiences. Together, these domains expand chess's reach: the former sustaining its tradition of mastery, the latter attracting new publics who encounter the game as spectacle before perhaps pursuing it as practice.

K1.3 Social media and streaming

The rise of social media has transformed chess into a form of continuous public performance. Platforms such as Twitch and YouTube now host communities in the millions, where popular figures like Hikaru Nakamura maintain direct, daily contact with audiences. His channel alone surpasses two million followers [83]. These streams blur the boundary between pedagogy and entertainment: lessons, blitz sessions, and banter unfold in real time, making the once-private domain of high-level play an accessible spectacle.

The influence of popular culture has further accelerated this shift. *The Queen's Gambit* (2020) did more than dramatise the life of a fictional prodigy; it catalysed renewed interest across demographics. In the months following its release, online registrations surged, chessboard sales spiked, and search traffic for basic chess terms rose to unprecedented levels [85, 86]. Streaming amplified this surge, with established content creators translating new enthusiasm into sustained engagement.

In this environment, chess is no longer confined to the board or the tournament hall. It circulates as a narrative, a performance, and a shared experience. The streaming era demonstrates that the popularity of chess cannot be measured solely by competitive participation; it must also account for the game's capacity to generate stories, communities, and cultural moments in digital space.

K1.4 Casual & Club Play

Beyond the arenas of streaming and competition, chess continues to thrive in its most familiar settings: schools, clubs, cafés, and households. These environments preserve the game's traditional social role, where learning often occurs informally, through family members, peers, or local mentors. For many children, the school chess programme provides a first structured encounter with the game, introducing rules and habits of concentration, patience, and strategic thought [74]. Clubs and community groups extend this learning into more sustained practice. Here, players develop styles, rivalries, and friendships, embedding chess within a rhythm of weekly or monthly meetings. The café game, by contrast, represents chess at its most casual: an open-ended conversation between strangers or friends, with the board serving as a shared language.

Physical sets remain indispensable in these contexts, and their continuing sales reflect the enduring appeal of tangible play. The persistence of casual and club play demonstrates that, even in an era dominated by digital platforms, chess retains its role as a face-to-face social practice.

K1.5 Global Chess Set Market

The chess set market provides a material index of the game's popularity. Millions of sets are sold annually across physical and digital retail channels, with values estimated in the billions. The range is striking: from inexpensive plastic boards designed for schools and casual players, to finely crafted wooden and luxury sets intended as collector's items or decorative pieces. Retail data show surges in demand following *The Queen's Gambit*, with U.S. chess set sales increasing by 87% and wooden sets leading the trend [85, 86]. eBay reported sales of chess sets and accessories rising by about 215% in that period [85].

The chess set market mirrors the trajectory of the game itself. It is at once traditional and modern, grounded in centuries-old practices yet invigorated by digital media and new audiences. The sustained rise in sales confirms that chess remains both a pastime and a commodity.

K1.6 Popular Types of Chess Sets and Sales Channels

Market segmentation reveals three broad categories:

1. Standard sets, often wooden or plastic, are used in schools and clubs (House of Staunton, 2025).
2. Luxury sets, crafted from fine woods, glass, or marble, are valued as both functional objects and cultural symbols [77].
3. Electronic sets, such as those produced by Millennium Chess, which integrate sensors and connectivity to digital platforms [78].

These categories reveal the flexibility of chess as a material culture and technological artefact. The game adapts to diverse contexts: functional in the classroom, ornamental in the study, and innovative in the digital domain.

Chess sets circulate through both online and offline retail. Online retail has become the dominant channel, driven by its convenience and breadth. eBay reported a 215% surge in chess sets and accessories during 2020, demonstrating the power of e-commerce [85]. Broader board-game retail statistics likewise show online channels leading growth, while physical toy and hobby stores remain important for tactile purchases [79, 81].

The in-store experience includes seeing, touching, and even testing pieces on a board. This provides a dimension of assurance and immediacy that online transactions cannot replicate. Seasonal trends further reinforce this channel, with holidays and local tournaments driving peaks in demand.

K1.7 Consumer Demographics and Seasonality

The purchase of chess sets spans a broad demographic spectrum, reflecting the game's accessibility across age and income. Children often receive chess sets as gifts, and schools purchase them in bulk as part of educational programmes [74]. Teenagers and young adults, influenced by online platforms and streaming culture, increasingly adopt the game as a pastime and a competitive challenge. Adults in their thirties to fifties often purchase sets for domestic use, while seniors are likewise significant consumers, turning to chess as a means of maintaining mental acuity and social engagement [82].

Income levels also shape purchasing patterns. Budget sets appeal to lower-income buyers and institutions seeking affordability at scale. Middle-income consumers gravitate toward durable wooden sets, balancing quality with reasonable cost. High-income buyers often invest in luxury sets crafted from fine woods, marble, or even precious metals.

The demand for chess sets follows recognisable seasonal rhythms, shaped by cultural calendars and competitive cycles. The most pronounced peak occurs during holiday seasons. Christmas, in particular, drives a surge in sales, with U.S. chess set sales increasing by 87% in the weeks after The Queen's Gambit [86]. Retail analysts note similar peaks around tournaments and school terms, consistent with broader board-game sales cycles [79].

K1.8 Impact of Technology

Technology has reshaped the landscape of chess, altering how the game is played and how physical sets are valued. Chess.com and Lichess anchor a digital ecosystem of millions of players [80, 84]. AI systems such as AlphaZero and Stockfish have transformed training [73]. Yet physical boards remain irreplaceable for tactile and social reasons. This coexistence of digital practice and material artefact underscores why the Craeft project's handcrafted set is strategically placed: it speaks to a culture that values both physical craftsmanship and digital innovation.

From online platforms to luxury markets, chess demonstrates resilience and adaptability. Its broad popularity, recognisability of rules, and cross-demographic appeal make it an ideal medium for craft experimentation. In choosing chess as the focus of a handcrafted set, Craeft aligned with a thriving, global market while also contributing an artisanal interpretation of a universally known game.

Therefore, the handcrafted chess set developed in Craeft is both justified and market-aligned. It draws strength from the game's cultural familiarity, benefits from its strong commercial presence, and exemplifies how craft innovation can connect with a global audience already predisposed to understand and value the object.

K.2 Chess Story threads

1) The game that travelled farther than armies

- **Hook:** Chess is basically a passport stamped by empires.
  Beats: Likely roots in **India (chaturanga, ~6th century)** → **Persia (shatranj)** → the **Islamic world** → **Europe**.
- Every stop leaves a trace: terminology (e.g., “check” from *shāh*), styles of pieces, and ways of teaching.
  Why it matters: Chess is a clean example of how ideas move: trade routes, courts, scholars, translations.

2) The rules that changed… and created modern chess

- **Hook:** One rule change made chess go from "slow strategy" to "tactical fireworks."
  Beats: Medieval Europe gradually sped the game up (most famously, the **queen** becoming the most powerful piece; bishops gaining long diagonals).
- Castling and en passant stabilised later.
  Why it matters: You can tell a broader story about **technology and taste**: faster games suited a different culture of competition and print-era analysis.

3) The legend of the rice grains on the chessboard

- **Hook:** A king thinks he's being generous; then discovers exponentials.
  Beats: The inventor asks for 1 grain on the first square, 2 on the next… doubling to 64 squares.
- It's folklore (versions exist across cultures), but mathematically unforgettable.
  Why it matters: Chess as a teaching story for **growth, scale, and unintended consequences**.

4) Chess as a courtly art, not a pub game

- **Hook:** Before chess was a sport, it was closer to "etiquette.
  Beats: Chess thrives in **courts, salons, and scholarly circles** because it signals patience, judgment, and education.
- Manuals emerge: openings, problems, moral lessons.
  Why it matters: Chess becomes a social technology: a way to rank minds without drawing swords.

5) The first "world champions" before there was a World Championship

- **Hook:** The title didn't exist, but the reputations did.
  Beats: Strong players became celebrities through exhibitions, odds games, and correspondence.
- Cafés and clubs became laboratories for theory.
  Why it matters: A story about how **modern sport** forms: spectatorship, rankings, rivalries, and press.

6) The birth of chess "science"

- **Hook:** At some point, chess stops being just cleverness and becomes a method.
- **Beats:** Thinkers argue about principles: development, initiative, pawn structure. The shift from romantic swashbuckling to positional logic (the "why" behind moves).
- **Why it matters:** Chess becomes a case study in **formal reasoning**: ideas you can teach, debate, and refine.

7) Paul Morphy: the meteor

- **Hook:** The greatest player in the world… for a moment, and at a cost.

- **Beats:** Morphy's mid-19th-century dominance, dazzling attacks, and public fascination. Then retreat from chess and a troubled later life.
- **Why it matters:** The tension between **genius, fame, and personal well-being;** a human story people remember.

8) The "Immortal" and "Evergreen" games as Victorian mythology

- **Hook:** Some games became scripture.
- **Beats:** A few famous 19th-century attacking games were retold like epic poems. They shaped what "good chess" looked like for decades.
- **Why it matters:** Chess history isn't only about events; it's about **which stories get canonised**.

9) Chess behind the Iron Curtain

- **Hook:** In the 20th century, chess becomes national infrastructure.
  Beats: The Soviet system treats chess as prestige and pedagogy: schools, trainers, publications. Champions as symbols; theory as collective production.
- **Why it matters:** Chess is an example of how states use culture for **soft power**.

10) 1972: Fischer–Spassky as a Cold War drama

- **Hook:** A match becomes a geopolitical Rorschach test.
- **Beats:** The "Match of the Century" is loaded with symbolism far beyond the board. Personality, pressure, media spectacle.
- **Why it matters:** It's the cleanest story of chess as **public theatre**.

11) Kasparov vs Karpov: rivalry as an engine of progress

- **Hook:** Two styles, two temperaments, one era; repeated collisions.
- **Beats:** Their matches pushed opening preparation, psychology, and endurance to extremes.
- **Why it matters:** Rivalries don't just entertain; they **force innovation**.

12) The machine arrives: from Deep Blue to the "alien" style

- **Hook:** We built an opponent that doesn't get tired—and then one that plays strangely beautiful chess.
- **Beats:** Computer chess evolves from curiosity to a dominant sparring partner. A turning point when humans stop asking "can we beat it?" and start asking "what can it teach us?"
- **Why it matters:** Chess becomes a public window into **AI and human learning**.

13) Women in chess: brilliance plus barriers

- **Hook:** The story isn't "they weren't there"; it's "they were pushed out."
- **Beats:** Pioneers who competed in mixed fields despite social limits; later, the slow growth of opportunities and role models.
- **Why it matters:** A way to talk honestly about **institutions, access, and talent**.

14) Chess as a printing-press phenomenon

- **Hook:** Chess modernised when it became reproducible.
- **Beats:** Books, columns, and later databases standardise notation and spread ideas quickly.
- **Why it matters:** The same move can be played worldwide because it can be **written down, copied, and analysed**.

15) Chess as a mirror of the world's anxieties

- **Hook:** Every era projects itself onto chess.
- **Beats:** Medieval morality tales, Enlightenment rationalism, Cold War ideology, AI-era questions about creativity.
- **Why it matters:** Chess is stable, but the *meaning* people attach to it changes; perfect for cultural history.

K.3 Story strategies

K.3.1 Pick one "core story" per product line

Don't try to sell *all* of chess history at once. Choose **one narrative theme** that matches your design/materials, and build everything around it.

Strong, customer-friendly themes:

- **"The Game That Travelled the World"** (India → Persia → Arab world → Europe): great for a *travel/Silk Road/cosmopolitan* aesthetic.
- **"From Courtly Art to Café Sport"** (courts, salons, cafés): great for an *elegant/heritage/gifting* vibe.
- **"The Rule Change That Changed Everything"** (the queen's rise, faster modern chess): great for a *modern, design-forward* set.
- **"Cold War: Chess as a World Stage"**: great for a *bold, graphic, 20th-century* set.

Name the set after the story and keep every touchpoint consistent.

K.3.2 Turn the story into physical "features", not just text

Customers pay for what they can *see/feel*. So, translate the story into design cues:

Board details

- **Travel theme:** border as a "route map" (stylised lines + waypoints), or a faint compass rose in the centre.
- **Court theme:** ornamental frame, heraldic motifs, subtle "library" palette.
- **Rule evolution theme:** small engraved timeline markers along the board edge (e.g., "Origins", "Persia", "Europe", "Modern").

Piece design

- **King/Queen:** make them the "hero" pieces tied to your story (e.g., queen subtly more modern/vertical to reference her rise in power).
- **Knights:** easiest piece to give cultural identity (horse, camel, abstract geometry) without becoming kitsch.

Packaging

- Use packaging like a museum object: "Collected/Edition/Provenance/Materials".
- Include a "certificate" that makes it feel limited and gift-ready.

K.3.3 Include a small story artefact inside the box

This is cheap to produce and massively boosts perceived value.

Best options:

- **Story card deck (6–10 cards):** each card = one vignette + one image + one "look for this detail on your set".
- **A folded "Chess Passport":** stamps for each historical stop (India, Persia, etc.), plus a short paragraph per stop.
- **A tiny booklet (12–16 pages):** minimal text, strong layout, makes it feel premium.

Key: keep each story to **60–120 words**. Customers actually read that.

K.3.4 Add a QR layer for modern customers

Put a QR code inside the lid:

- 2–3-minute audio story ("The journey of chess in three scenes")
- a short page with beautiful photos + the story
- optional: "How to teach someone in 10 minutes" (this increases gift purchases)

This also gives you a reason to email-capture later (warranty/registration).

K.3.5 Product page structure that converts

Use the story to structure the page:

1. **One-line hook** (emotional)
2. **What makes this set different** (3 bullets)
3. **The story** (short, with a timeline graphic)
4. **Materials & craft** (credibility)
5. **Giftability** (arrives ready, story cards included)
6. **Close-ups** (show the "story features" you referenced)

K.3.6 Copy you can reuse (plug-and-play)

Here are a few ready-to-use examples you can adapt:

Option A: Travel theme

Tagline: *A board game that crossed empires.*

Short description: "This set is inspired by chess's long journey from South Asia through Persia and the medieval world into Europe. The board carries subtle 'route' motifs, and the pieces are designed to feel timeless—like an object that could have travelled in a merchant's chest. Included inside: a short 'Chess Passport' telling the story in six stops."

Option B: Court & café theme

Tagline: *From royal tables to crowded cafés.*

Short description: "Chess began as a courtly art—a quiet way to display judgement and patience—before becoming the public sport we know today. This set celebrates that shift with an elegant, heritage look and a small story booklet designed like a museum label: concise, factual, and gift-worthy."

Option C: Modern evolution theme

Tagline: *One rule change made chess explode.*

Short description: "Modern chess is faster, sharper, and more tactical than its ancestors. This set is built around the moment the game transformed—when the queen became powerful, and the pace accelerated. Included: story cards explaining the evolution and pointing out design details on the pieces."

K.3.7 Create "collectable editions" without extra manufacturing pain

Same base set, different story layer:

- **Silk Road Edition** (travel)
- **Café Edition** (Europe + clubs)

- **Machine Age Edition** (AI era)

Different insert + colourway + nameplate = fresh product line and repeat buyers.

K.3.8 One warning: keep claims safe and elegant

Chess origins and dates can be debated. In your story text, use language like:

- "**likely** originated…"
- "**often traced to**…"
- "**popularised through**…"

This keeps you credible and avoids pedantic pushback.

Annex L Shine Bright Like Silver Installation

L.1 Greek

SILVERSMITHING MUSEUM
IOANNINA

Piraeus Cultural Foundation

ΟΔΗΓΟΣ ΕΓΚΑΤΑΣΤΑΣΗΣ ΕΦΑΡΜΟΓΗΣ

Εισαγωγή:

Το “Shine Bright Like Silver” είναι μια εφαρμογή για Android κινητές συσκευές, σχεδιασμένη για να αναβαθμίσει την εμπειρία επίσκεψης σας στο Μουσείο Αργυροτεχνίας στα Ιωάννινα.

Επειδή η εφαρμογή βρίσκεται ακόμη υπό ανάπτυξη και δεν εχει δημοσιευτεί στο Google Play Store, θα χρειαστεί να επιτρέψετε την εγκατάσταση “Άγνωστων” εφαρμογών στην συσκευή σας.

Απόρρητο & Προστασία Δεδομένων :

Σας ενημερώνουμε ότι κατά την εγκατάσταση και τη χρήση της εφαρμογής :

- Δεν περιέχεται κακόβουλο λογισμικό – η εφαρμογή είναι απολύτως ασφαλής για εγκατάσταση και χρήση.
- Δεν συλλέγονται, αποθηκεύνται ή κοινοποιούνται προσωπικά σας δεδομένα σε τρίτους.
- Όλες οι διαθέσιμες λειτουργίες της εφαρμογής έχουν ως μοναδικό σκοπό να εμπλουτίσουν την εμπειρία ξενάγησης σας στο μουσείο.
- Η εφαρμογή δεν απαιτεί στοιχεία ταυτοποίησης χρήστη.

Γιατί να ενεργοποιήσετε τις “Άγνωστες Πηγές” ;

Απο προεπιλογή, το Android επιτρέπει εγκαταστάσεις μόνο από το Google Play Store. Δεδομένου ότι το APK δεν είναι διαθέσιμο στο Play Store, θα χρειαστεί να γίνουν συγκεκριμένες αλλαγές στην συσκευή σας για να μπορέσει να γίνει με επιτυχία η εγκατάσταση.

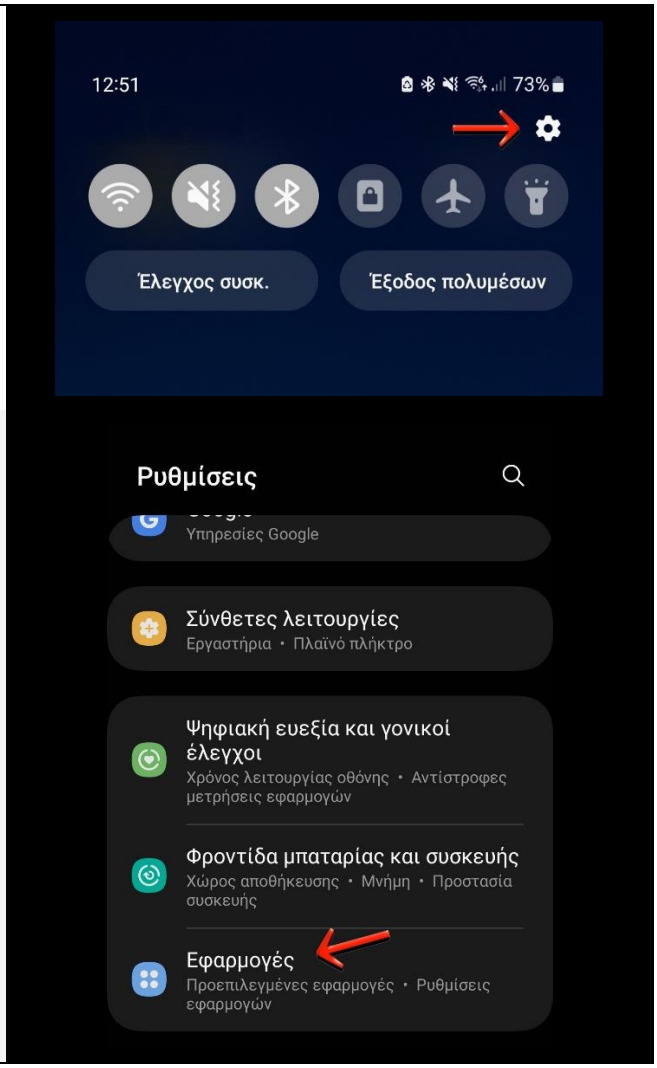
Πρόκειται για αλλαγές που απαιτουνται μόνο για μια φορά, μετά την εγκατάσταση της εφαρμογής μπορείτε να τις απενεργοποιήσετε αυτές τις αλλαγές ξανά.

Υποστηριζόμενες Συσκευές :

Smartphones με λογισμικό Android (Samsung – Huawei και οι περισσότερες μοντέρνες συσκευές με Android 8.0+)

Χώρος για εγκατάσταση (λιγότερα απο 250 MB)

Οδηγίες Εγκατάστασης Βήμα-Βήμα

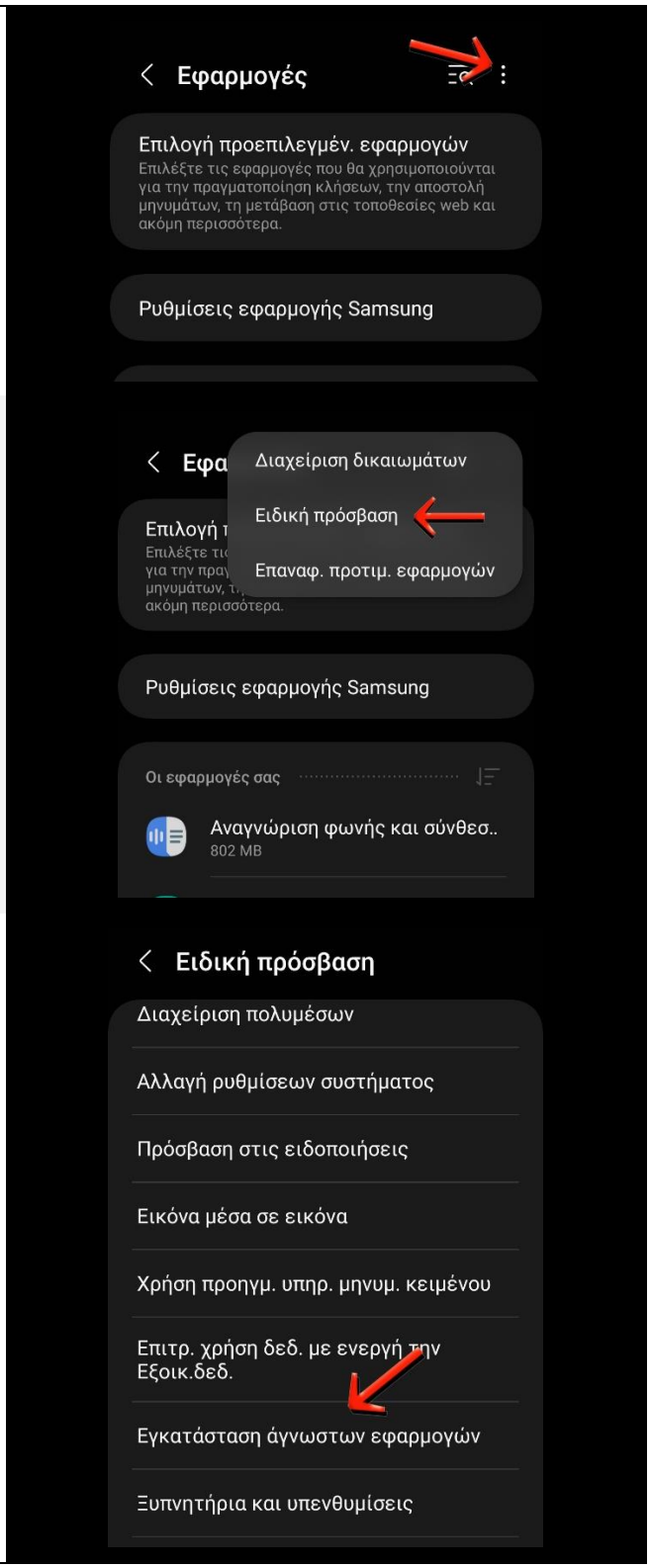
Προετοιμασία της συσκευής σας Ανοίξτε τις **Ρυθμίσεις**.	
Βρείτε το πεδίο **Εφαρμογές** .	

Πατήστε στο Μενού ⋮ (τρεις τελείες) πάνω δεξιά.

Επιλέξτε **Ειδική Πρόσβαση.**

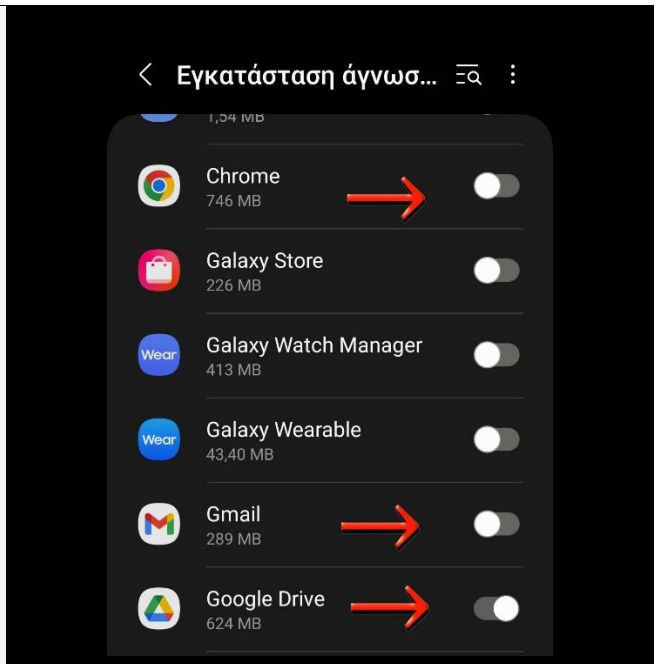
Πατήστε το πεδίο:

Εγκατάσταση Άγνωστων Εφαρμογών.



Ενεργοποιήστε το δικαίωμα στα παρακάτω πεδία :

- Google Chrome
- Google Drive
- Gmail

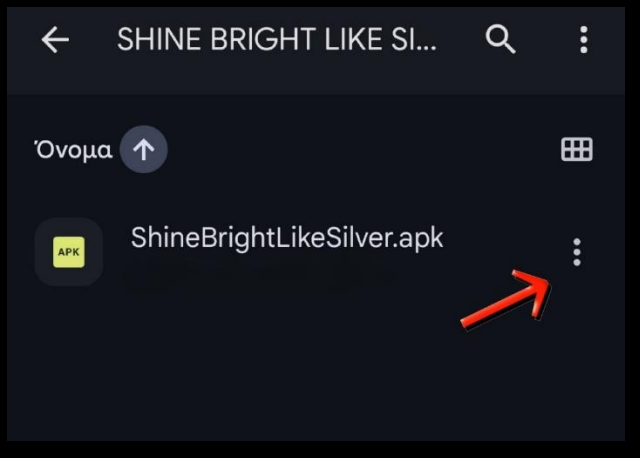


Κατεβάστε το APK

Μεταβείτε στον σύνδεσμο του APK:

https://zenodo.org/records/18771799

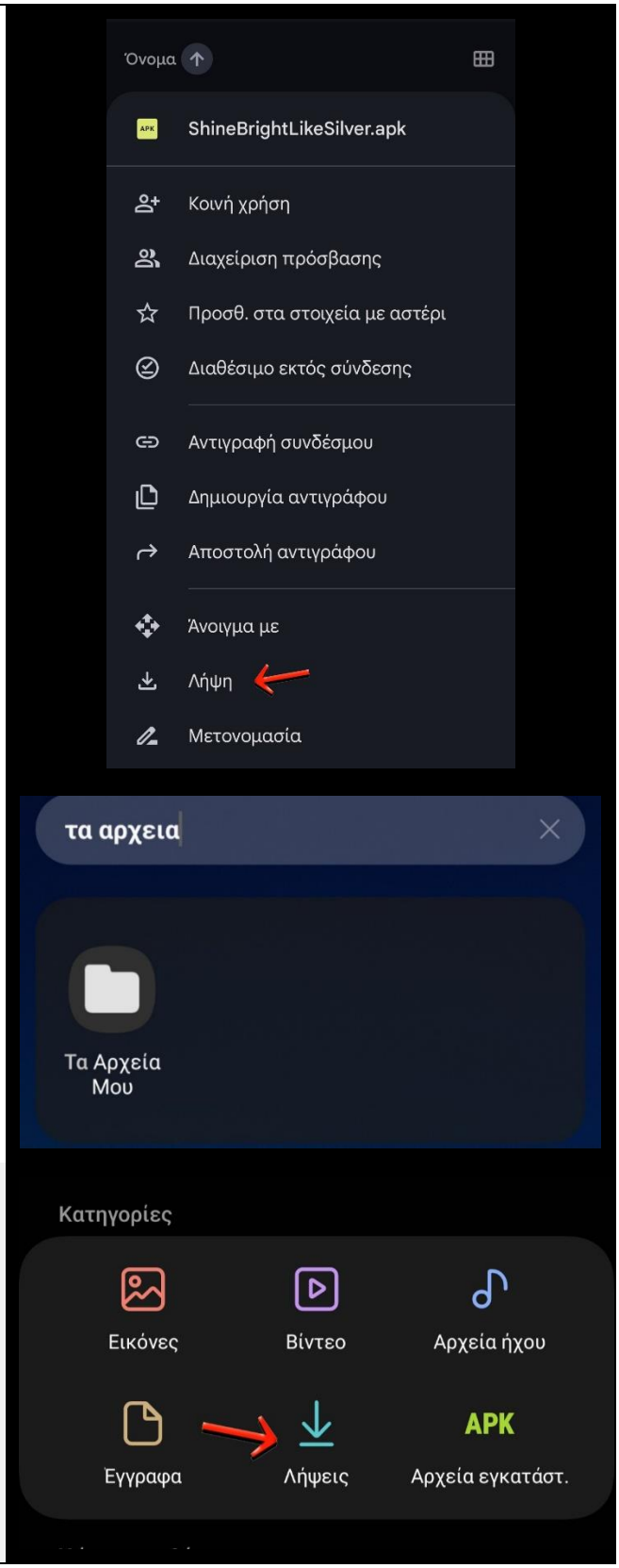
Πατήστε το εικονίδιο λήψης.

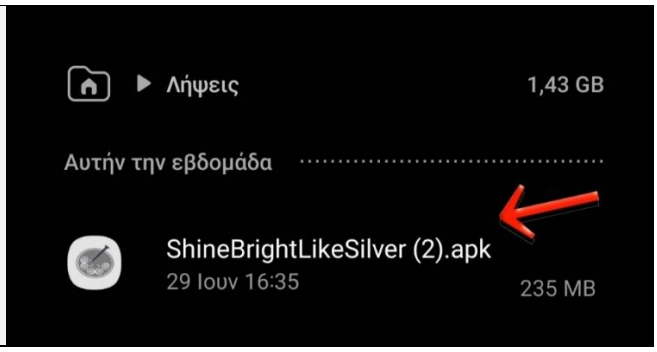


Περιμένετε να ολοκλήρωθεί η λήψη.

Εγκαταστήστε το APK

Βρείτε το αρχείο που μόλις κατεβάσατε στην συσκευή σας (ShineBrightLikeSilver.apk)



Πατήστε πάνω του, εάν σας ζητηθεί, επιβεβαιώστε την Εγκατάσταση.	

- Περιμένετε να ολοκληρωθεί η εγκατάσταση.
- Ξεκινήστε την Εφαρμογή
- Μετά την ολοκλήρωση της εγκατάστασης , θα βρείτε την εφαρμογή Shine Bright Like Silver διαθέσιμη στην κινητή σας συσκευή στο Μενού εφαρμογών ή διαφορετικά στο πλαίσιο αναζήτησης.
- Μπορείτε πλέον να τρέξετε την εφαρμογή και να απολαύστε την διαδραστική ξενάγηση στο Μουσείο Αργυροτεχνίας .
- Πλέον μπορείτε να επαναλάβετε το 1ο Βημα για να απενεργοποιήσετε τις ρυθμίσεις για την Εγκατάσταση Αγνώστων Πηγών

Σας ευχαριστούμε που μας βοηθάτε να δοκιμάσουμε και να βελτιώσουμε την εφαρμογή!

ΙΤΕ ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ ΚΑΙ ΕΡΕΥΝΑΣ | FORTH FOUNDATION OF RESEARCH AND TECHNOLOGY - HELLAS

L.2 English

SILVERSMITHING MUSEUM IOANNINA | Piraeus Cultural Foundation

SHINE BRIGHT LIKE SILVER

Version: 0.1 Beta, June 2025

INSTALLATION GUIDE

Introduction:

"Shine Bright Like Silver" is an Android application designed to enhance your visit to the Museum of Silversmithing in Ioannina Greece.

Because the app is still under development and not yet available on Google Play Store, you will need to allow the installation of "unknown apps."

Privacy & Data Protection:

We inform you that during the installation and the use of this application:

- No harmful software is included – this app is totally safe.
- No personal data is collected, stored, or shared with third parties.
- All functionality is purely to enrich your museum tour experience.

The app operates solely to provide the intended museum-tour service, without requiring any user identification.

Why Enable "Unknown Sources"?

By default, Android only allows Installation of apps from the Google Play Store. Since our APK isn't published yet, you must grand permission for specific apps in order to install it.

This is a one-time setup, after the installation you can turn the settings off again if you wish.

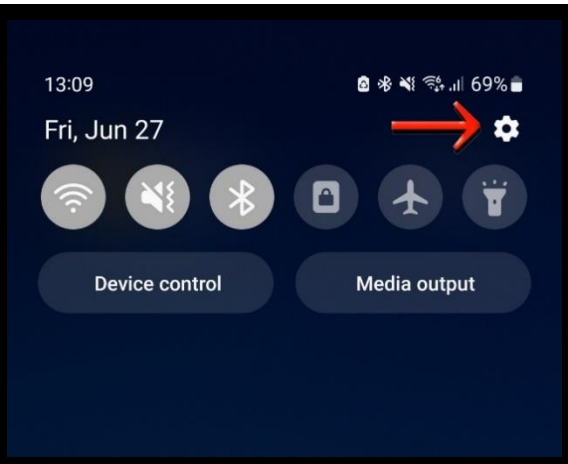
Supported Devices:

- Android Smartphones (Samsung devices, Huawei, and most modern Android 8.0+ devices)
- Sufficient free storage (Approx. 250 MB)

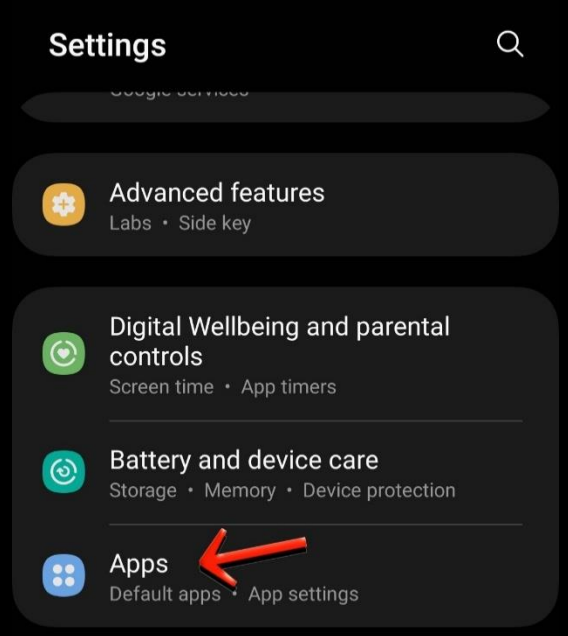
Step-By-Step Installation Guide

Prepare your Device

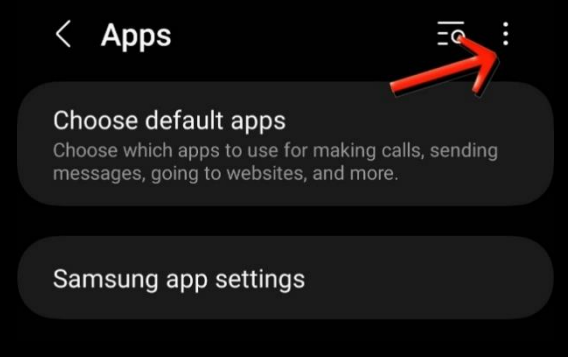
Open Settings.

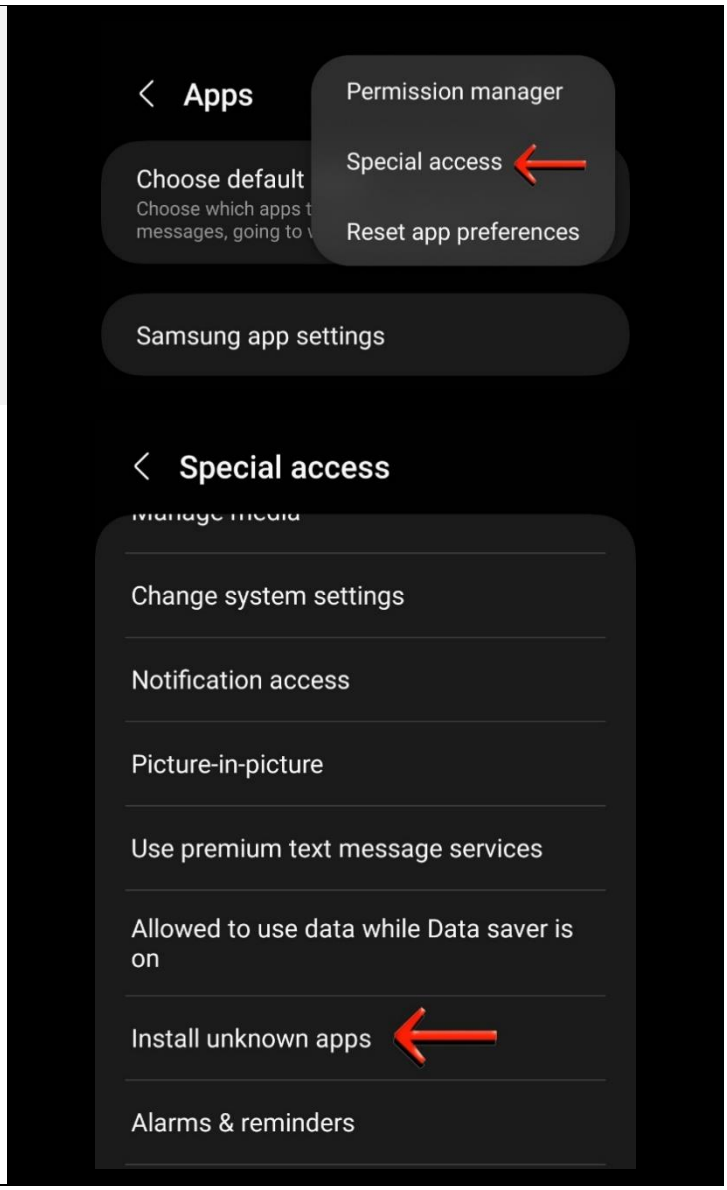


Find **Apps (or Applications).**



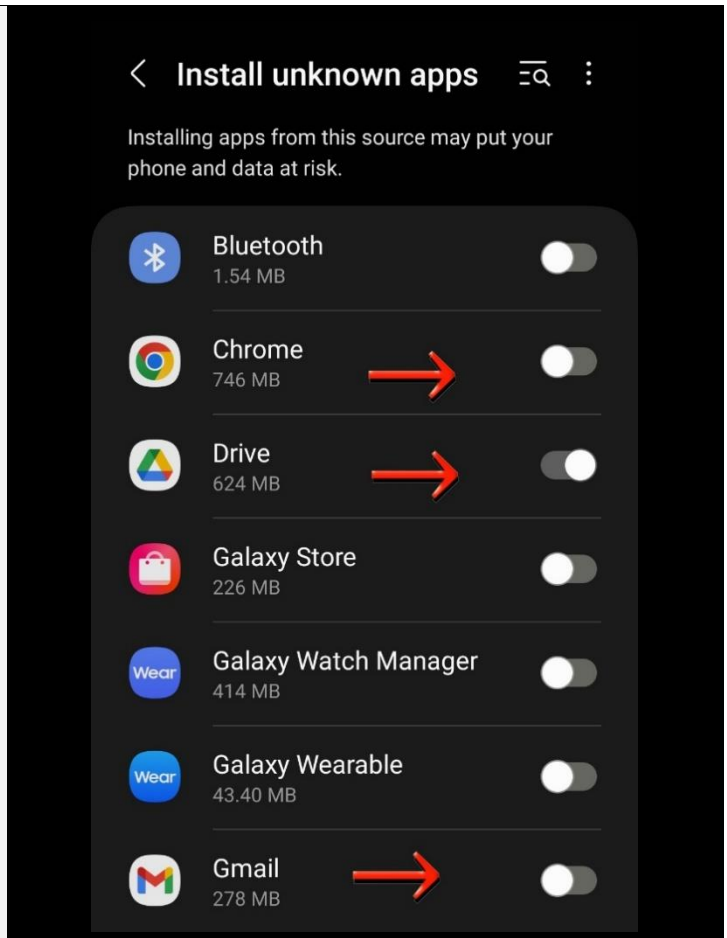
Tap the ⋮ **menu** (three dots) in the top-right corner.



Select **Special Access**	
Tap **Install Unknown Apps**.	

Enable from the list below the following

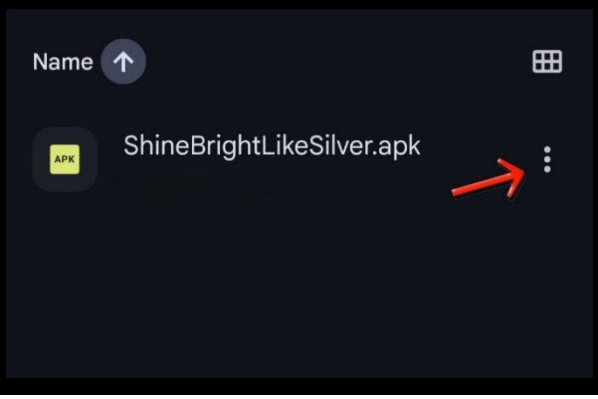
- Google Chrome
- Google Drive
- Gmail



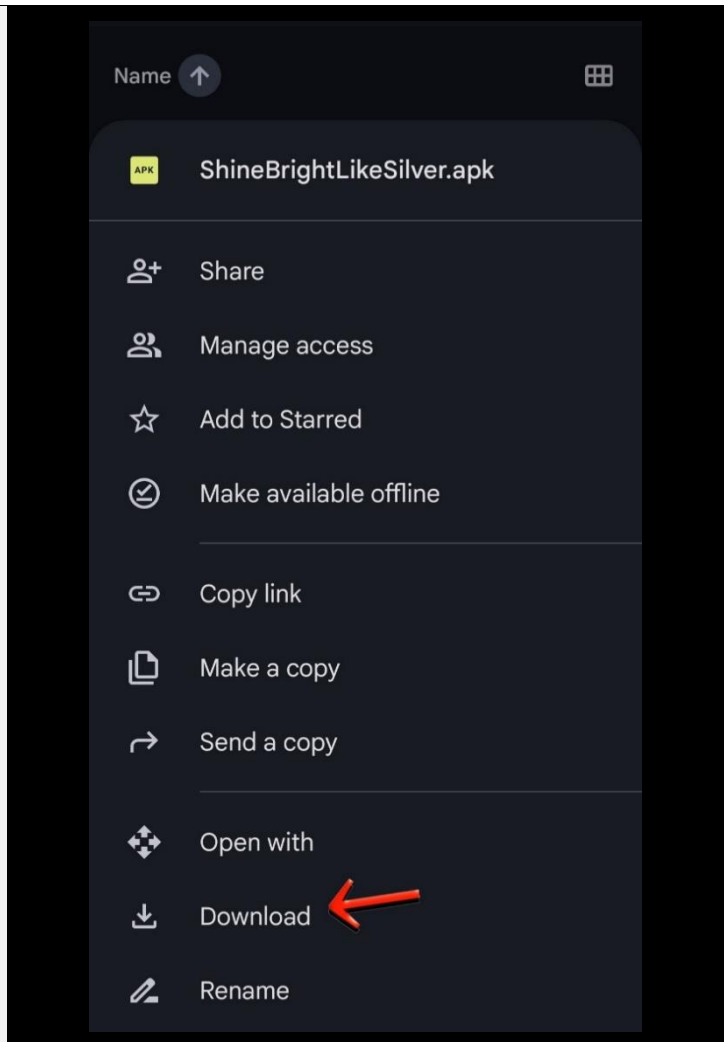
Download the APK

Navigate to the Link for the APK.

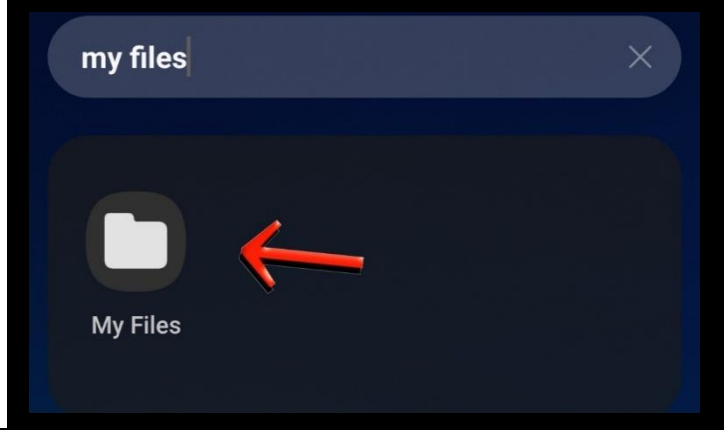
https://zenodo.org/records/18771799

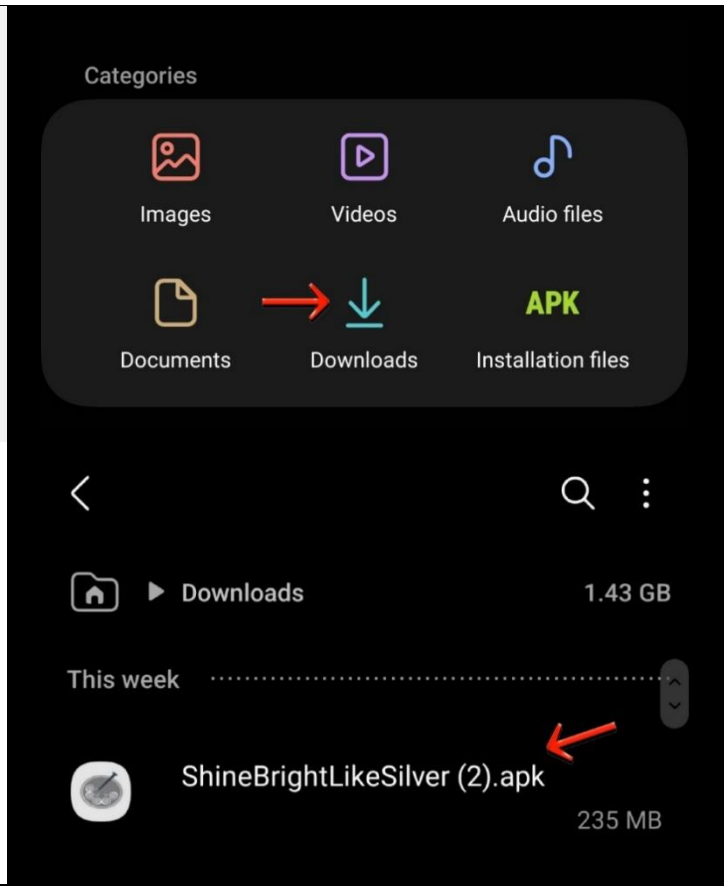


Tap the **Download** icon.



Wait for the download to complete.



Install the APK Find the downloaded file in your folders (e.g. ShineBrightLikeSilver.apk).	

- When prompted, confirm **Install.**
- Wait for the installation to finish.
- Launch the App
- Once the installation completes – you will find Shine Bright Like Silver in your app drawer or by searching it.
- Enjoy your guided interactive experience at the Museum of Silversmithing!
- (Optional) Disable Unknown Sources Permissions
- After the installation has completed you can repeat Step 1 but this time to disable the Special Access Sources for extra security.

Thank you for helping us test and improve the application!

ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ ΚΑΙ ΕΡΕΥΝΑΣ | FOUNDATION OF RESEARCH AND TECHNOLOGY - HELLAS

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