



Representation and Preservation
of Heritage Crafts

The Impact of Learning and Engaging Around Heritage Crafts in Mingei

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Executive summary

This impact report on the Mingei project responds to three impact research questions and one overarching research question.

What is the impact of the Mingei heritage partners embracing digital transformation in the context of Mingei and the digitisation of the tangible and intangible aspects of heritage crafts?

- To what extent did the tools and processes introduced by the Mingei project (and the impact evaluation work package) contribute to processes of digital transformation?
- To what extent has the Mingei project supported the development of stronger or new connections or ways of connecting with wider heritage crafts communities, for longer-term impact in terms of heritage crafts digital preservation and transmission?
- What might the potential impact and legacy in terms of the Mingei project be, when considering the possibilities of reuse and the future exploitation of the Mingei tools, approaches and products?

We respond to these research questions by thinking about how and what impact can be created for participating partners when impact is approached not as something that happens at *the end* of a project, but as something that happens *throughout*.

Context. In the years since the Mingei project was launched back in 2019, what we thought we knew about the digital preservation of heritage and how we engage with museum audiences has changed beyond recognition. The challenges posed by the Covid-19 pandemic were significant. It restricted engagement with heritage crafts communities and limited the testing of the pilot exhibitions. Yet it also reinforced the value of digital preservation and outreach and introduced new ways of working, and it is likely to contribute to new perspectives and a more resilient future.

Impact chapter #1. Mingei introduced new tools, processes and ways of working that were strategically designed to create organisational and professional impact for the partners throughout the project timeline. These methodologies, in addition to the technical innovation experienced in the project, include co-creation, Team-Based Inquiry and the use of the Generic Learning Outcomes framework. In our evaluation, we found that the tools and approaches introduced contributed to processes of digital transformation.

Impact chapter #2. Reintroducing the key learnings from past deliverables on engaging with heritage crafts communities, we highlight that Mingei's emphasis on collaboration and partnerships is likely to bring about new ways of working together across functions and competencies, strengthening networks and promoting cross-disciplinary understanding and knowledge which can, in turn, help the CHIs tackle future challenges and reinforce their attractiveness in front of the public and audiences in the "experiences market". Though challenged by the Covid-19 pandemic, both technical and heritage partners have experienced positive outcomes relating to how they work together and with wider heritage crafts communities.

Impact chapter #3. Mingei's goal has not been just to have the content on the platform but to allow and encourage its exploitation. Mingei's open-source approach, combined with an explicit understanding of the reuse potential of the technical tools and approaches created, has set in place strong conditions for future impact. The potential legacy of the project is strong and future heritage crafts organisations and communities, as well as wider CCIs, heritage institutions, policy-makers, tourism agencies and local governments, technical partners, and educationalists including museum mediators, are among the many stakeholders who may benefit from the approach taken.

Conclusions. Blending an impact evaluation approach with a strategizing approach has the advantage of focusing the project on where we can realistically, and within the timeline of the project, assess impact. It also guides legacy activities after the project ends. Despite the identified barriers to digital transformation, outcomes like positive attitudinal change, more confidence and a positive reputational impact, as well as further project collaboration and technical innovation, are likely to lead to more sustainable futures for Europe's diverse heritage crafts.

1. Introduction

1.1 General introduction

This study evaluates to what extent organisational impact is experienced by Mingei partners and sets out the learning that has taken place through accessing and engaging with the digital and procedural outcomes of the project. It sets out a project impact overview by evaluating the potential of the Mingei protocol and platform to enhance innovation and engagement with heritage crafts in the future.

The remainder of this introduction sets the scene of what is evaluated to be the impact of the Mingei project. The context chapter first lays out the environment in which Mingei operates, and in particular, reflects on the impact of the Covid-19 pandemic on the heritage sector and shares insights into the current digital state of the art in digital crafts preservation, reporting on the debate at the [Mingei Day international seminar](#).

Impact Chapter #1 then introduces our approach to stimulating and evaluating the organisational impact generated through the methodologies applied in Mingei for the heritage and technological partners involved. We share the main themes of what we learned as well as the methodology, including an overview of Team-Based Inquiry cycles (as a mechanism to generate organisational impact) and the Generic Learning Outcomes (as a mechanism to plan for and evaluate informal professional learning). Impact Chapter #2 considers relationships between heritage partners, heritage crafts communities and technological partners and these relationships as mechanisms for impact. We also evaluate the co-creation process followed. As often as possible throughout the project, an effort was made to take into consideration the range of actors and partnerships observed and worked with in the project and more globally in safeguarding ICH (UNESCO, 2003; Alivizatou, 2021), i.e. “cultural brokers”, university researchers, tradition bearers, heritage crafts communities and institutions, and, of course, technology experts.

Finally, Impact Chapter #3 assesses the future impact of Mingei and its longer-term legacy for diverse stakeholders and the engagement of key digital heritage communities in education and research. The report concludes with a summary of the report findings as well as reporting on Mingei in numbers (outputs). Two appendices then follow which present first the adapted Generic Learning Outcomes framework and findings of the Mingei project and finally an overview of the DigiTraining ‘digital transformation syllabus’, which gives context to a training course provided for CHIs to exemplify uptake of Mingei outputs in heritage education and training.

1.2 Impact and Mingei

1.2.1 Redefining impact for the Mingei context

A definition of impact taken from the Europeana Impact Playbook (Verwayen et al., 2017) was presented in Deliverable 7.1 as the working definition of impact used by the project:

Changes that occur for stakeholders or in society as a result of activities (for which the organisation is accountable). Verwayen et al (2017, pg. 10)

Europeana's definition suggests that impact is felt by others rather than something also experienced by those leading the activity. This is similar to definitions presented in other contexts as shown in the box below.

- The United Kingdom's Research Excellence Framework (UKRI, 2022) where 'impact is defined as an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia';
- The MeMind project (Alberti, 2021) where impact is discussed as an organisation's relevance and the difference it makes for its audience (social and economic impact)
- Interreg Central Europe (2021) where impact is discussed as changes for society;
- The SoPHIA platform and project (SoPHIA platform, no date) consider impact in terms of sustainable tourism and wellbeing; and,
- The MUSETECH Model (Damala et al, 2019) introduces three key stakeholders to the impact of digital interventions in museums: the heritage professional, the heritage institution, and the museum visitor.

We can see from the descriptions above that definitions of impact less often explore the impact experienced by heritage institutions or other partners. They also consider impact as something that takes place *after* an activity. In Mingei, however, we focus on and explore impact as a change *for or in* the organisation and its staff undertaking the activities *during* the project. The rationale for this is explained in the extracts from the first Mingei impact evaluation deliverable (D7.1) presented on the following page.

As with most [European-funded technical development] projects, the products that are being developed will be finished and ready for exploitation when the project ends. This has led to the Mingei team to review the concept of 'impact'. Rather than focusing on 'impact' as what happens after the product (and project) is finished, the team decided to view impact as something that has the potential to occur and be improved throughout the project. *Mingei deliverable 7.1*

For the sake of this final deliverable then, and based on all that we have learned through the past years, we present a revised and extended impact definition:

Impact in digital heritage projects can be understood as the change or changes that occur for stakeholders or in society as a result of activities undertaken by a heritage organisation and their partners. It can also be the result of organisational change processes experienced by the heritage organisation, their colleagues and/or their partners.

What impact is experienced by the organisation affects how the organisation interacts with its public and creates wider impact (Holden in Bollo, 2013). The impact (utility and usability) of the project outcomes on end-users (e.g. those that use the platform or attend the pilot exhibitions) or on wider heritage craft (HC) communities is outside the scope of impact assessment. We believe that this approach to impact is indicative of an "emergence of a trend inward" as an introspection of the role we all may play (as researchers, CH professionals, heritage and indigenous crafts practitioners and stakeholders) in intangible cultural heritage processes (Stefano and Davis, 2016).

Nonetheless, the *potential* impact (often indicated by already existing positive outcomes) for heritage crafts communities and wider stakeholders will be evaluated later in the third impact chapter in terms of potential and future legacy and impact (e.g. exploitation by research and education, tourism and the CCIs).

1.2.2 Organisational impact and digital transformation

In early 2021, Europeana published a definition of digital transformation that sets out the need to focus both on technology as well as the mindsets of those working in heritage organisations:

Digital transformation is both the process and the result of using digital technology to transform how an organisation operates and delivers value. It helps an organisation to thrive, fulfil its mission and meet the needs of its stakeholders. *McNeilly and ter Burg (2021)*

Mingei's impact assessment approach aligns with this definition, as it focuses on the experience of the heritage partners as they embrace different digital transformation processes and build capacity in terms of the digitisation of tangible and intangible heritage crafts and crafts processes, including their engagement with heritage communities and audiences.

The core research question that guides the analysis in this report is then be as follows:

✓ Research Question

What is the impact of the Mingei partners embracing digital transformation in the context of Mingei and the digitisation of the tangible and intangible aspects of heritage crafts?

In the conclusions to this report, we set forward our response to this overarching research question and in each of the three impact chapters, we respond to the research sub-questions identified below.

1.2.3 Impact focus in Mingei

Mingei focuses on three impact areas (as outlined in D7.1).

1. Impact as organisational learning;
2. Relationships of heritage partners with stakeholders; and,
3. Strategizing.

These three areas are set out in Table 1 on the following page and accompanied by a corresponding research sub-question. These three impact areas shape the structure of this report and each impact chapter responds to the relevant research question in its conclusions.

Core research question:	Research area	Research sub-question
What is the impact of the Mingei heritage partners embracing digital transformation in the context of Mingei and the digitisation of the tangible and intangible aspects of heritage crafts?	Impact as organisational learning - impact area #1 Skills development amongst heritage partners: using new tools, identifying and exploring new creative opportunities and craft areas.	To what extent did the tools and processes introduced by the Mingei project (and the impact evaluation work package) contribute to processes of digital transformation?
	Relationships with heritage crafts communities - impact area #2 Building new networks, working with local craft communities.	To what extent has the Mingei project supported the development of stronger or new connections or ways of connecting with wider heritage crafts communities, for longer longer-term impact in terms of heritage crafts digital preservation and transmission?
	Strategizing - impact area #3 Developing a mid-term and long-term strategy to ensure future impact and encourage legacy.	What might the potential impact and legacy in terms of the Mingei project be, when considering the possibilities of reuse and the future exploitation of the Mingei tools, approaches and products?

Table 1. The three impact evaluation activities in WP7, the core research question, and corresponding research sub-questions.

In each of these areas, the team has analysed and/or evaluated existing or potential outcomes, primarily for the heritage partners involved, but also for Mingei’s tech partners and other stakeholders. In doing so, our goal has been to set in place the conditions for longer-term impact. For this, we also took under consideration the literature which emphasises the importance and particularity of the participation of community groups in this work as oral histories, traditional knowledge and beliefs are gradually incorporated in official museum narratives usually curated only by museum or CH professionals (Alivizatou, 2016). Communities were involved in all three Mingei pilots: mastic growers association in the Chios Mastic Museum pilot; glassblowers in the Conservatoire des arts et métiers (CNAM) pilot; and pilot and volunteers in the Haus der Seidenkultur (HdS) pilot. The 2003 Convention on the Safeguarding of the Intangible Cultural Heritage (UNESCO, 2003) also gives a central role to cultural communities, groups and individuals associated with intangible cultural heritage (Blake, 2009).

1.2.4 Challenges to impact in Mingei

The Covid-19 pandemic has had a significant impact on WP7 activities (and many other work packages). It was very difficult to open up Mingei project activities to members of local heritage crafts communities in the Covid-19 context of social isolation, despite increasing online activities. This includes the planned co-creation processes, where we see the challenges of participation of local stakeholders (e.g. those from the Chios Gum Mastic Growers Association were unable to attend planned sessions in Chios which were converted to a digital format because museums in Greece were closed for extended periods in both 2020 and 2021). While there were challenges in some areas, the consistent use of Team-Based Inquiry as a tool used throughout Mingei has strengthened a reflective stance on evaluation, impact assessment, stakeholder engagement and learning about the work practices of heritage partners.

One of the challenges of evaluating at the end of the project, however, is recall bias, which is particularly the case due to the project extension and the rough Covid-19 years. Nonetheless, the findings generated through this evaluation and analysis will have an impact on a key impact area for Mingei, that is, its legacy.

2. Broader heritage crafts contemporary context

The Mingei approach must be discussed in light of further developments that have taken place within the wider digital cultural heritage sector since the launch of Mingei. We consider first the challenges posed by the Covid-19 pandemic, informed by our experience during the project and working hand-in-hand with the heritage partners. Then we present a report of the Mingei Day online seminar as an insight into contemporary issues in the digital crafts heritage context. We close with a review of digital transformation tools and digital maturity paradigms that have emerged in recent years and which offer an extended opportunity to measure digital transformation as organisational impact. The analysis in this chapter is supplemented by data from the survey of heritage partners as part of Mingei WP7, presented in italics.

2.1 Challenges posed by the Covid-19 pandemic

The Covid-19 pandemic has led to the acceleration of the ongoing digitisation and digitalisation of the heritage sector. The sanitary restrictions that ensued meant that museums across Europe had to close (NEMO, 2021) and ongoing waves of the virus meant that additional measures were taken at different times throughout the Mingei project timeline. Safety protocols during these times have been strict and delayed the testing of the exhibition pilots. Even to date, it has been a challenge for the HdS to engage with the public due to the age and resulting vulnerability of their volunteers. With that in mind, digitally available heritage content has never been so important, for use in education, research and much more (Samaroudi et al., 2020).

Towards the end of the project, and several months after museums began shakily finding their feet again and welcoming visitors back, we asked the heritage crafts partners to reflect on the impact of Covid-19 on their work and participation in Mingei. We found different negative and positive outcomes of the Covid-19 pandemic.

Challenges encountered during the pandemic

- There were expectations of more fieldwork and direct engagement with heritage crafts communities that were not met due to Covid-19 sanitary restrictions.
- It would have been valuable for digitisation experts to have been on-site in the partner projects more often, which was not possible due to travel restrictions.
- It was more challenging to build relationships with crafts practitioners (where these relationships were not previously in place).
- There were challenges in communication with museum staff and volunteers, some of whom were not confident in using digital technology for communication.

- There were challenges of interdepartmental working in some of the heritage partners due to changing tasks in response to the pandemic.
- Due to museum closures, there were delays in installing the pilot exhibitions.
- There were mental and emotional challenges to deal with, too, including operating in a completely new context.
- Direct contact with the public was not possible on-site:
 - *All of a sudden we lost everything we knew, we were definitely not prepared, and we had to make all the necessary adaptations first of all to continue our presence as an organisation and then to make our collaborations work.*

Opportunities arising from a new way of working during the pandemic

- In some cases, the opportunities to engage audiences through digital means became more tangible and concrete (due to necessity but also the quality of the experience, which may not have been expected):
 - *I also enjoyed virtual tours, whereas before I did not really consider that as a viable option.*
 - *The pre-Covid planned temporary exhibitions were opened via streaming which was a novelty for [heritage partner] but proved quite successful.*
- The pandemic made partners value their (face-to-face) interactions with crafts practitioners even more
- The pandemic reinforced the need for digital presentation and preservation, including the opportunity this gives for wider audience engagement:
 - *The need for digital presentation ... became more apparent during Covid.*
 - *[the pandemic] has also raised my awareness of digital crafts presentation.*
 - *[...] It has highlighted the need for accessibility and how digital (re)presentations give such opportunities on a worldwide scale.*

- Heritage partners had to find new ways to stay in touch with and engage their public and stakeholders, including volunteers
- In one case, a respondent suggested that the pandemic led to a significant shift in mindset:
 - *One day we were attached to tradition and the other we were making new strategies and practices focused on new technology*

Analysis

Mingei seemed like a timely opportunity in face of the unexpected and catastrophic consequences of the Covid-19 pandemic. It reinforced the value of digital preservation, highlighted the importance of good relationships and communication with all stakeholders, and though we encountered challenges, we are confident that how the heritage and technical partners responded to this has given them new perspectives and a more resilient future.

2.2 Report on the Mingei Day international seminar

'[Why do we preserve heritage?] ...not only to protect... [but] to learn from the past and improve the future'. Marinos Ioannides (UNESCO chair of Digital Cultural Heritage at Cyprus University of Technology)

This section of the report presents insights into the contemporary state of the art relating to the digitisation and representation of digital heritage crafts. The short, medium and long term impact of Mingei as a flagship project on digitising and preserving heritage crafts was the main subject of an [international online seminar](#) organised by Mingei partners. In addition to disseminating the project's successes and learnings, one of the underlying motivations was to invite the scientific, technological and heritage crafts communities to celebrate the potential of digital heritage crafts preservation.

On 10 March 2022, as part of the [Mingei Day](#), we held an online seminar with invited experts from the Mingei project and peer organisations and projects, including the European/Connecting Europe Facility project [CRAFTED](#). The [Mingei Open Platform](#) was presented in the form of four short demonstrations that bookended themed discussions.

Mingei

Mingei Day

Webinar Preserving traditional crafts using technology

10 March 2022

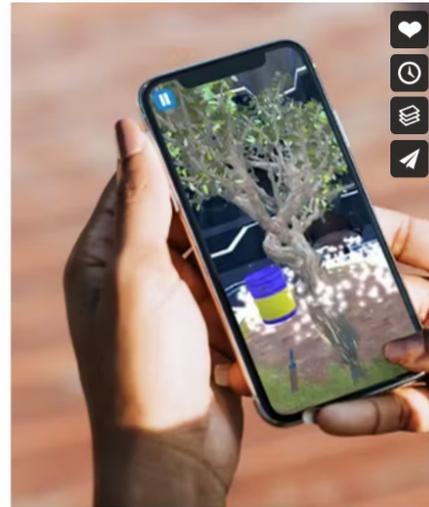


Figure 1. Lead slide for the Mingei Day on 10 March 2022.

Mingei was set up to meet the challenge of digitising and representing crafts and should be seen in the context of a network of peers and experts in Europe (and of course, further afield) who are employing digital technologies - from motion tracking to geo-tagging - and ontologies to meaningfully share the 'recipes' of crafting processes and the stories that explain its social and historical significance, as described by Mingei project coordinator, Xenophon Zabulis (FORTH, Mingei) and Mingei Platform developer Carlo Meghini (CNR-ISTI, Mingei).

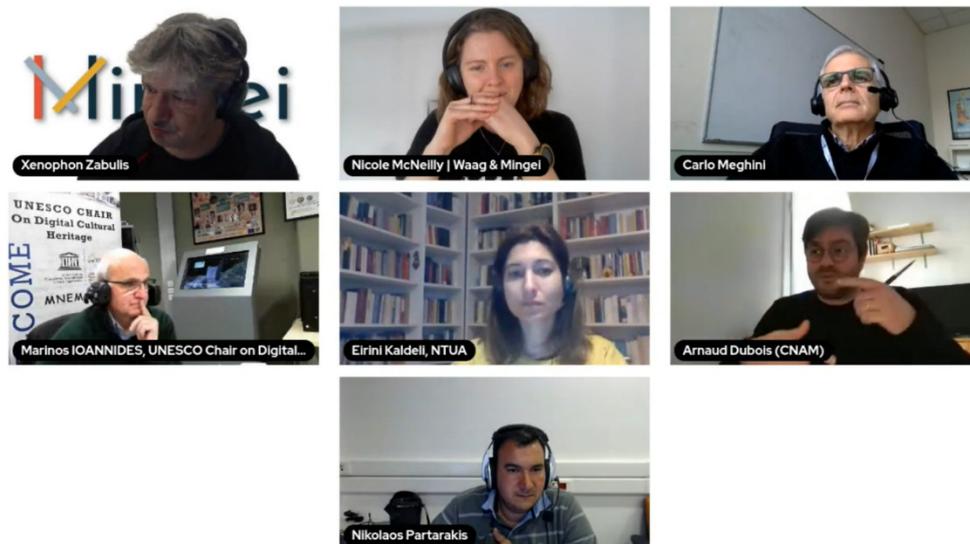


Figure 2. Still from Mingei Day international seminar, 10 March 2022, showing all seminar panellists.

Eirini Kaldeli (NTUA, CRAFTED project) invoked the challenge of representing different types of crafts heritage and the knowledge and know-how that must be included to meaningfully represent this heritage digitally. She connected this to the standards required by the [Europeana Data Model \(EDM\)](#) while describing activities designed to strengthen

existing ontologies (vocabularies) that explore and standardise the many existing crafts terminologies. Also reinforced was the need for collaborative learning in this area, to which the seminar was a contribution in this vein.

The Mingei project takes an innovative step in crafts preservation by putting narrative at the centre. It established a channel between the human and the digital assets through the formal representation of the stories and the meaningful management of the heritage data. This represents a significant change, according to Carlo Meghini, and reinforced by Marinos Ioannides (UNESCO Chair Digital Cultural Heritage, Cyprus University of Technology). He stated that the greatest challenge faced by those working in digital heritage crafts preservation is not only the digitisation of the tangible or intangible but both together with the memories that give this meaning, in a way that allows these memories to be understood by all audiences and so that anyone can learn from them.

There are challenges, however, to the EDM (to which Europe's digitised heritage available on Europeana must conform to). Xenophon Zabulis argued that it does not yet adequately allow for the capture of diverse narratives and the representation of all of the vocabulary used and captured in Mingei and other projects. It also lacks the presentation of events. In the past, as Carlo Meghini explained, the data were not there to tell extensive crafts stories (often not in catalogues or even formally documented). Capturing stories provides richer representations but it also poses ongoing technical questions (many of which are now being addressed). Eirini Kaldeli explained that this need has been identified by the CRAFTED project and new formats (e.g. galleries) help to explore the narratives behind the crafts.

'...the craft is alive only if someone performs the craft'. Arnaud Dubois

Even with the most advanced digitisation and representation of heritage crafts loses the essence of the craft without performativity, according to Arnaud Dubois (CNAM, Mingei). While there is some fear that 'digital' might replace crafts practices (which Arnaud explained came from a confusion in some instances between digitisation and automation or robotisation), craftspeople nonetheless acknowledge the need for heritage digitisation for preservation and to gain a wider audience. Eirini Kaldeli suggested that organising hands-on workshops alongside digitisation efforts is key to creating impact for wider audiences, because, as Nikolaos Partarakis (FORTH) explained, there is no way (yet) to digitally transmit the pain, effort and feeling of craft practices. Digital knowledge cannot replace the practices needed to perfect the craft, but without preserving this knowledge, we might lose opportunities to train future generations.

Marinos Ioannides asked the panel the question of what artificial intelligence (AI) can be used for. Machine learning has pushed forward advances in crafts representation and preservation and, for example, in automating annotation. This technology can help those searching for knowledge find and filter appropriate knowledge sources. Eirini Kaldeli introduced the 'human in the loop' concept, which is the fruitful combination of human and artificial intelligence. Human intelligence can strengthen the results of AI algorithms and further train them, and AI can automate mundane tasks. Humans can annotate data and produce domain-relevant training data, further advancing AI. Carlo Meghini noted that AI can help with more error-prone human tasks, but that the definition of intelligence remains a

question. Arnaud Dubois noted that AI brings new ways to document complex knowledge, but that this benefits from multidisciplinary (human) approaches to the complexity of human experience. Marinos Ioannides then reflected on the use of AI to support humans in managing complexity but that we shouldn't forget the unlimited boundaries of human learning and the human drive for preservation.

The application of the Mingei protocol is also generic enough to be applied to other heritage contexts and in different disciplines, and the protocol guides those responsible for preservation to extract narratives from individual objects to uncover and present additional knowledge relating to both tangible and intangible elements. The Mingei protocol defines what is expected by all scientists involved in the documentation process, supporting much-needed multidisciplinary collaboration.

It is still not possible to express or replicate the interaction of the craftspeople with their material because this changes in every instance and stage of the process of the craft. Yet what can be expressed is the need to emphasise performativity, the recreation of relationships between people and matter, as well as to acknowledge that there are some elements of the process of the craft that cannot be understood or captured.

Conclusions

Learning from ancient history and philosophy, the seminar shared insights into the key questions and state of the art in digital heritage crafts preservation. Raising questions of the purpose and limitations of artificial intelligence and technological advancement, Mingei pushes forward the opportunities of digital heritage crafts preservation by reinforcing the role of the human story, of the narrative, in these processes, of balance and respect for craft as it is protected and preserved for future generations. Watch the full seminar on the Mingei project website.

2.3 Digital transformation and digital maturity self-assessment resources - rapid review

In light of the speed of change in the discourse around the digital transformation of the cultural heritage sector (noted above), several resources have recently been developed that heritage organisations can use to self-assess their digital maturity and/or track their digital transformation. The question areas and questions used in these tools help to contextualise the current way of thinking about digital transformation in heritage. For that reason, we undertook a rapid review of nine different digital transformation self-assessment tools or conceptual paradigms. This was in response to an identified lack of such a resource. Our goal is that this collection helps to stimulate even more thinking about organisational impact and digital transformation long after Mingei finishes in May 2022.

Methodology

Nine digital transformation and digital maturity resources were reviewed, most of which related to cultural heritage or culture. These models are presented in a download available from the [Mingei website](#). Other models were considered in brief and are presented later in this analysis. Resources reviewed in this document fall roughly into two categories:

self-assessment tools and conceptual paradigms (as shown in the list below). When needed, hypothetical information was inputted to test the tool.

Resources reviewed

We reviewed nine self-assessment tools and digital transformation/digital maturity paradigms, as follows:

Digital self-assessment tools

1. Focus Model (DEN, Netherlands)
2. Self-evaluation tool - digital maturity (Meemoo and the Flanders Department of Culture, Youth and Media, Belgium)
3. Digital Culture Compass Tracker (multiple stakeholders, UK)
4. DASH Survey (multiple stakeholders, UK)
5. Cultural Heritage Institution Self-Assessment Tool (inDICEs project)
6. Microsoft Education Transformation Assessment Tool for Libraries and Museums
7. Digital benchmarks for the culture sector (Collections Trust, UK)

Paradigms of digital transformation/digital maturity

1. Chicago History Museum seven perspectives (Ludden and Russick, 2020)
2. Forrester’s Digital Maturity Model 5.0

Other models have been referenced and evaluated in the wider literature. Price and James (2018), Kane et al. (2017) and Vicars-Harris (2016) each have a three-part model (as shown in the table below). Similarly, a three-part understanding of organisational digital maturity is used in Europeana’s impact assessment of a participatory heritage project (McNeilly, 2020).

Kane et al. (2017) (not heritage-specific)	Vicars-Harris (2016)	Europeana Sport impact assessment (2020)
Early	Digital infancy - moving towards better embracing digital	Low - Little or no experience with digital collections, e.g. do not have digitised collections or if these exist, they are not published for reuse
Developing	Digital maturity - understanding the importance of digital	Medium - Some experience with digital collections, e.g. may have a digital collection
Maturing	Post-digital - where digital is embedded across the organisation	High - Experienced with digital collections, e.g. providing content to Europeana, actively doing something with their digital collections

Table 2. Comparison of other paradigms used to describe digital maturity.

Summary analysis

- Digital transformation is understood as inherently positive. Few resources are up to date enough to assess the advantages, opportunities and disadvantages of the rapid digital acceleration brought on by the Covid-19 pandemic.
- Self-assessment tools are often visually compelling and visualise self-assessment data in an easy-to-understand manner which demonstrate gaps or areas for attention.
- Paradigms assessing digital maturity usually range from between three to five levels.
- Some self-assessment tools offer sophisticated options to save data and compare this at a later date to track progress.
- Some self-assessment tools offer the option to project a vision of where the organisation wants to be, thus offering an opportunity to direct the respondent towards relevant information to help make this happen.
- Where this information was available, we learn that self-assessment tools have not been extensively used. This ranges from, for example, fewer than 100 applications (Digital Maturiteit, Meemoo) to over 400 (DASH survey).
- In most cases (but not all), self-assessment involves one response per organisation (noting, however, that an organisational response may be collaboratively developed).
- Some resources are relevant across the cultural sector and others are heritage-specific. It is assumed that heritage-specific tools may be most valuable but this could vary by organisational context, e.g. size of budget, main income source, number of volunteers or staff.
- Most resources (excluding one) are available in English.
- Most resources come from Northern Europe (UK, Belgium, Netherlands) and the United States.

Conclusions

There is a clear drive to support heritage organisations in their digital transformation through self-assessment and a better understanding of what digital transformation can be understood to be. This is led by both practice and by academia, and often in partnership. Yet there are continued criticisms (Weisberg, 2022) of jargon and a lack of clarity of what digital transformation means.

Nonetheless, should an organisation wish to strengthen their digital maturity, this review has illuminated the wealth of conceptual and self-assessment tools to help them on its way. It is not clear to what extent standardising a digital transformation paradigm would be useful considering the great diversity in heritage organisations in Europe (demonstrated on a small scale by the Mingei heritage partners), let alone in the rest of the world.

With this in mind, a key gap in the literature is an evaluation of how and to what extent these resources are helping organisations to digitally transform, and if the self-assessment mechanism (coupled with guidance) catalyses digital changes, either in terms of mindset or technology. In addition, case studies of the experience of diverse and differently-sized (e.g. from volunteer-led to national) heritage organisations that are applying and testing the tools would be helpful in this evaluation. Such an analysis would help to answer outstanding research questions and drive the development of valuable resources that would help organisations of any size thrive in a digital context.

Recommendations and next steps

Though there was no capacity for the heritage organisations to be coached to use and apply (one or more of) these tools, these findings have been published on the Mingei website as a standalone publication (van der Vaart et al, 2022) to support the heritage craft partners (and many more heritage organisations) to choose the tools that might best help their future digital planning (and digital transformation) processes and impact for their stakeholders.

3. Impact chapter #1: organisational learning and digital transformation

3.1 Introduction

“The ‘lifeblood’ of intangible cultural heritage is its cultural communities, social groups, culture keepers, and artists, the experts who develop, use and change it. The effectiveness of any safeguarding initiative, then, hinges on the level of their involvement.” *Stefano (2021)*

“Being part of Mingei was a wonderful and insightful experience on many levels.” *Heritage partner response to the WP7 questionnaire (May 2022)*

Mingei introduced new tools, processes and ways of working that were designed to strategically create impact for the partners throughout the project timescale. This first section of the impact evaluation report presents our findings in terms of the organisational and professional impact created by the Mingei project. To deliver the Mingei objectives whilst creating impact, we employed two specific methodologies or tools. Firstly, Team-Based Inquiry, which we found to have been a valuable process to follow throughout the Mingei project timescale, in particular, as this fairly simple, iterative tool supported a focus on exhibition visitors and other key stakeholders including, for example, museum professionals and volunteers.

Secondly, we review the Generic Learning Outcomes framework, a tool to inform planning, data collection, and evaluation, which we adapted for the Mingei context. Finally, to conclude this section, we explore the key outcomes for the three Mingei heritage partners in terms of the organisational impact - digital transformation - they experienced as a result of their participation in the Mingei project.

We set out the first research sub-question to guide our efforts in this first impact area and respond to this in the section conclusions.

✓ Research sub-question

To what extent did the tools and processes introduced by the Mingei project (and the impact evaluation work package) contribute to processes of digital transformation?

3.2 Methodology to create impact for Mingei partners

3.2.1 Team-Based Inquiry (TBI)

3.2.1.1 About TBI

[Team-Based Inquiry \(TBI\)](#) is an iterative evaluation method developed by the Nanoscience Informal Science Education Network (NISE Net) to help education professionals reflect on their educational programmes, collect data and make tangible changes. Because TBI is developed for practitioners in an informal learning context and is designed to be easy to use, scalable and efficient, it is a very useful tool for heritage professionals. The iterative nature of TBI, as well as the focus on teamwork, suit the concepts of proactive partnership working and digital heritage projects as processes. TBI is scalable and allows teams to start small and familiarise themselves with the approach, before potentially delving into bigger questions or more complex studies.

For the sake of brevity, for more information about TBI, please see the downloadable hands-on guide published on the [Mingei website](#) (van der Vaart et al., 2022).

3.2.1.2 Mingei and TBI

In total, eight TBI cycles were conducted throughout the project. The heritage partners were coached by a member of Waag but conducted the cycles independently according to the time and resources available. Waag also conducted its own Mingei-related TBI cycle. The TBI questions investigated by the heritage partners and Waag were as follows:

PIOP

- To what extent are national and international tourists visiting the Chios Mastic Museum interested in mastic production?
- How can we make clear and understandable instructions for the digital applications for museum visitors to make (better) use and be comfortable using the digital applications?
- To what extent do the museum professionals understand how the digital applications work, feel comfortable using them and can explain their use to visitors and new colleagues?

HdS

- Where can we find potential volunteers?
- How can we improve our non-guided visitor's museum visit experience?
What do our visitors particularly like/What do they think was missing from the visitor experience.

CNAM

- Why are there so few visits to the materials gallery?
- What sort of pictograms, and colour codes could be used in the galleries to identify the different materials presented?

Waag Learn team

- What makes impactful and effective communication and dissemination?

Reflections on the TBI research questions and purpose

As we mention in our published [hands-on guide](#) (van der Vaart et al., 2022) the cyclical and iterative nature of TBI, as well its focus on working to solve the research question as a team, makes it suitable in a context of proactive partnership and skills development in processes of digital transformation, where we do not focus only on the results but the impact created through the process and the resulting potential future impact.

Reflecting on the questions set out above, we see that the questions set by the heritage partners focussed on questions of engaging and creating a better experience for visitors, creating better relationships with colleagues and creating wider impact. Though our original intention was to conduct three cycles per heritage partner, in many instances the TBI cycles expanded after the original question was set to capture even more learning and to create even more impact for the heritage partners. Therefore, despite having fewer TBI cycles, we are confident of the impact and learning this generated because of the process it entailed. We report on this below.

3.2.1.3 Impact on the heritage partners

The TBI process was not one that we had implemented before. Nevertheless, it proved to be very useful when it comes to providing answers through a participative - bottom-up approach and it has helped us in defining improvements in our decision making processes. Through our evaluation of the TBI cycles, we can evaluate to what extent and in what contexts TBI cycles had value for the Mingei heritage crafts partners by asking the questions of what worked well and what could be improved.

What worked well

✓ Impact through knowledge-sharing

In terms of what worked well, we can evaluate the impact of both the individual heritage partners conducting TBI cycles and of the heritage partners coming together every three weeks to share what they were learning and experiencing.

In one instance, following on from a discussion about the quality and usefulness of data being captured in visitor books, we discussed ways of collecting more objective information about a visitor's experience in both informal and formal light-touch, creative and engaging ways. Though this might not be something the partners can implement before the project finishes, this is likely to have a positive future impact for them and their audiences.

We have three examples of themes common to all the heritage partners that emerged through discussions around the TBI cycles. The first was around informal data collection opportunities. The second was on the security of the digital devices that are being used in the exhibition pilots in the three museums. How can a museum ensure that its technology remains safely in place while creating the best and most enjoyable experience for visitors? The third was around how to train museum professionals on how to use the applications and new digital technologies. We, therefore, saw that what each partner is learning is relevant to the others, no matter how different their context might be, which we interpret as being a positive outcome for a museum professional's self-confidence (included in the GLO framework presented later). See, for example, [PIOP's blog](#) sharing the insights gained after their third TBI cycle.

✓ Attracting new users and those interested in heritage craft

In their first TBI cycle, the Chios Mastic Museum investigated to what extent museum visitors were attracted due to their interest in the craft of mastic production. Capturing data using a pre-existing questionnaire that captured both qualitative and quantitative data, they found that the museum has a substantial impact in drawing tourists to the area and that the data suggest that this impact is increasing over time. The findings led to recommendations which could be shared with museum colleagues but also with tourism representatives for the area.

✓ **Improved relationships with colleagues and stakeholders**

TBI cycles provided the heritage partners with a different tool that helped them to incorporate and learn from the views of their colleagues, museum staff or volunteers. Yet in some cases, the novelty of the methodology meant that it was a challenge to engage colleagues in the TBI cycles as they were not aware of or willing to 'buy in' to the approach.

✓ **New problem-solving tools**

The questions asked encouraged heritage professionals to consider 'various aspects of running a museum from different angles'. All of those surveyed consider using the method again in the future.

What could be improved

- ✗ **Clearer instructions** and an overview of the process from the beginning would be valuable for heritage partners.
- ✗ **Heritage partners** do not necessarily have the agency to suggest changes in approach at their institutions, so we can't guarantee that the process will be used in future.
- ✗ **Wider colleagues** not involved in Mingei were involved in TBI cycles, meaning that the approach had to be explained to get their buy-in and participation. In some cases, this was a challenge and additional resources (e.g. a short overview) might have been valuable.

3.2.1.5 TBI: conclusions and recommendations

TBI cycles are simple mechanisms that help teams align, problem-solve and improve their practices, whether this relates to implementing new digital technologies or strengthening stakeholder relationships. We have seen that the very process of discussing findings helps to generate group learning. It helps to address the three key audiences (as set out in Damala et al., 2019): museum professionals, institutions and the user. In parallel, frameworks like the MUSETech Wheel (Damala et al., 2019) can help to set out areas in which organisations can improve their processes relating to digital technology, situating the TBI cycles and knowledge processes in a much bigger context. To summarise, TBI is a tool that can answer, in a simple way, much bigger questions relating to key stakeholders and key questions facing heritage crafts organisations in the contemporary, digital, context.

3.2.2 Waag TBI cycle

✓ Waag TBI question

What makes impactful communications and dissemination?

Having seen the impact of the TBI cycles on the heritage partners, the Waag team decided to do one cycle themselves. The Waag team researched its question by collecting perspectives from the project partners and our wider networks on what works and what doesn't in terms of communications and dissemination. Our goal was to illuminate the key challenges to impact and to create recommendations on how we can create the most impact through communications and dissemination activities. Importantly, our goal was to strengthen the final months of the Mingei project and its legacy. In sharing the survey amongst our network, we realised that we had identified yet another gap in existing literature and guidance, as many of those who completed the survey were keen to have the findings made available for them to use.

In a series of posts on the Mingei website, we have published the findings of this review. We identified eight key challenges to impact through communication and dissemination and presented three overarching solutions, in combination with practical tips. In addition, with the findings we collected, we were able to add extra depth to content created in D7.1 on how to measure the impact of dissemination and communication activities. This was published in a second blog post in the Waag TBI series

For the sake of brevity, the Waag TBI findings and recommendations are not reported here but can be viewed on the Mingei website. Read more about what makes [impactful communication](#) and dissemination and how you can [measure this impact](#).

Impact of the Waag TBI cycle

Reflecting on how we conducted a TBI cycle in the Waag team working on Mingei, we note the following positive outcomes for Waag, Mingei partners, and those who read and benefit from the publication of the Waag TBI cycle findings:

- Closer team-working on an area of mutual concern (Mingei impact measurement WP7 and communications and dissemination WP8).
- Likely positive influence on the writing and planning of future funding proposals and project delivery, due to improved and more impactful communication and dissemination planning.
- Mingei partners are planning more strategically for dissemination and communication impact after the project ends, which may lead to greater sector impact as a result of the project's findings.

We feel that these outcomes demonstrate how even one TBI cycle can generate tangible benefits for those taking part and for their stakeholders.

3.2.3 GLO framework - setting out what we learned

3.2.3.1 Introduction

The Generic Learning Outcomes are underpinned by a broad definition of learning which identifies benefits that people gain from interacting with arts and cultural organisations. [Arts Council England](#)

The GLOs provide five categories and 33 outcomes that relate to outcomes emerging from interaction with arts and culture. There are no specific indicators but the outcomes themselves are designed to support the coding and interpretation of qualitative and quantitative data.

In D7.1, we list three uses for the Generic Learning Outcomes (GLO) model: planning, evaluation and reporting. We use the GLOs in all three capacities in Mingei: planning data collection, evaluating processes (data analysis) and reporting on impact.

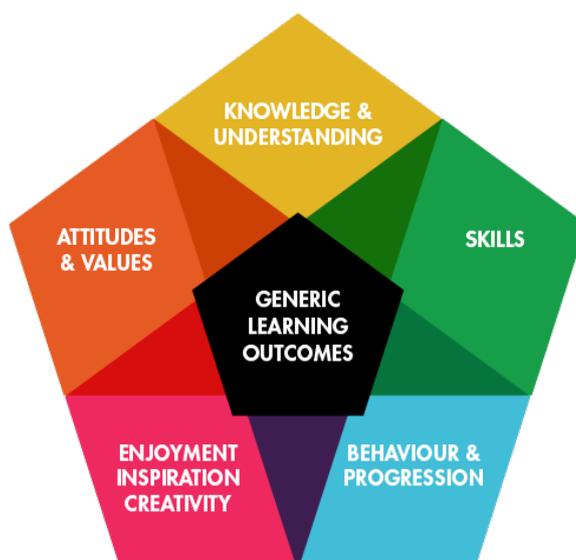


Figure 3. Visuals of the five GLO categories, taken from the website of [Arts Council England](#).

The main beneficiaries under focus in the GLO framework are end-users (e.g. the audience of the activities). It's about people - specifically, visitors to museums. On the other hand, Mingei WP7 focuses on the professionals and volunteers who work in the heritage craft organisations and the technical partners. Mingei proposed to extend, apply and test the GLO framework to professional outcomes relating to digital transformation and heritage crafts. The section below outlines how, during the Mingei project, we further developed and applied the GLO framework to explore its use as a tool for institutional and organisational learning in heritage crafts settings.

Components	Original GLO framework	GLO framework as adapted in Mingei
Whose experience is being evaluated?	Museum visitors/users of educational projects	Heritage professionals
Focus	Impact of projects, programmes or products	Impact
Number of learning outcomes identified	33	21
Additional outcomes identified that are not contained in the framework?	N/A	Yes

Table 3. Comparison of the original GLO framework with the adapted version used in Mingei.

3.2.3.2 Methodology

The methodology adopted to apply, extend and evaluate the GLO framework can be summarised as follows:

1. An Excel spreadsheet was created to map the GLOs by (personal/individual learning and organisational) learning.
2. Each outcome was initially assessed for its relevance in each category using a [yes-to some extent] scale. Relevance was defined according to the following criteria:
 - Relevance to activity in or objectives of the Mingei project
 - Relevance to activity or outcomes relating to processes of digital transformation
 - Relevance to organisational impact (i.e. strategy, planning, programming)
 - Relevance to individual professional impact (i.e. where change can only be experienced on and reported on an individual level)
 - Whether they were specific enough to be understood in the context
3. Not all outcomes are relevant for the Mingei professional and organisational impact context. In the end, 21 outcomes (out of the possible 33) were considered relevant. Example indicators were then developed for some of these outcomes to help validate the selection.
4. Not all impact areas/outcomes relevant to Mingei and professional/organisational impact and digital transformation could be mapped onto the GLO framework.

The adapted GLO template (Figure 4) is presented in full in Appendix 1 and sets out the key areas of learning from the heritage partners.

Generic Learning Outcomes - heritage partners	Relevant to Mingei context	High-level indicator	Suggested example finding (prior to research, validate with the heritage partners)	Validated indicator(s) PERSONAL IMPACT	Validated indicator(s) ORGANISATIONAL IMPACT
Skills		New or improved skills in relevant areas			
Knowing how to do something	Y	- New (or improved) skills identified	Extended knowledge of how to work with technology partners	- I feel I have gained more experience working in an international project with people from different backgrounds and professional skills	----
Being able to do new things	Y	- Sense of increased empowerment	Feel more confident to work on digital projects	- Desire to be involved in future projects; involved with other actors in the field (Europeans)	----
Information management skills	Y	- New (or improved) skills identified	Using new digital tools or other tools for the outputs of the project	<i>None identified</i>	<i>None identified</i>
Communication skills	Y	- New (or improved) skills relating to partnership working or communication identified - Reported better communications with public/audiences - Reported better communications/relationships with volunteers	Feel more able to collaborate with technology partners in future	- I would discuss more with the technical partners and try to have a better idea of their expectations as we did not seem to share these until some time in the project (my feeling anyway!) to avoid misunderstandings - It has changed my way of working with technical partners to develop digital applications.	- The need of volunteers who are at home in digital world has become very apparent, also training for the present volunteers to encourage them to embrace the new technology
Intellectual skills	N	----	----	----	----
Social skills	N	----	----	----	----
Physical skills	N	----	----	----	----
Knowledge & Understanding		Better understanding of digital collaborations, requirements of partnerships with digital providers		-through Mingei, I was introduced to impact assessment -it was a new procedure to use archival and	

Figure 4. An overview of part of the GLO framework, adapted and used in the Mingei context, is presented in full in Appendix 1.

3.2.3.3 Application and testing of the GLO framework for Mingei

The selected outcome areas and relevant example indicators were used to shape semi-structured interview questions for preliminary individual interviews held in February - March 2022. They were later also used to shape a digital questionnaire that was shared with heritage partners and technology partners to inform this report. The GLO framework was then used to organise and analyse the data captured. It shapes how we report on the findings in this report.

In Table 4 (below) we summarise the relevance of each of the five GLO impact areas to the Mingei context and report on the corresponding outcomes experienced by heritage partners.

GLO category	Summary of relevance, interpretation of the category for Mingei	Comment on heritage partner outcomes
1. Skills	New or improved skills in relevant areas	Skills identified in many areas, excluding digital skills, including working with technical partners
2. Knowledge & Understanding	A better understanding of digital collaborations, requirements of partnerships with digital providers	Many areas of knowledge and understanding developed, including the interest in and understanding of digitalisation
3. Enjoyment, Inspiration, Creativity	Enjoyment in the project, inspiration to do something new	Mingei was inspiring in its digital approach, the new methods introduced (e.g. co-creation), and in stimulating future potential activity and application of what has been learned

GLO category	Summary of relevance, interpretation of the category for Mingei	Comment on heritage partner outcomes
4. Attitudes and values	Attitudes to self-reported digital maturity	Relevant only to personal/professional outcomes, we noted attitudinal change, more confidence and reputational impact
5. Activity, Behaviour & Progression	Reflection on past activities, identify any changes, identify where possible the influences to cause the change, identify future intended or planned actions	Mingei has inspired future activity, and some of the processes introduced in Mingei are likely to be used in future

Table 4. Table summarising the approach taken and what was learned in Mingei in each of the five GLO categories.

For more insights into the outcomes experienced by the Mingei partners, classified according to the five GLO impact areas, please see Appendix 1.

3.2.3.4 Reflection on the choice and application of the GLO framework

We found outcomes in the data collected from heritage partners that would fit all selected outcomes. We also found, however, that there was duplication across the framework, for example, 'Knowing how to do something' and 'Being able to do new things' are very similar. We found other indicators of organisational or professional impact that could not be easily included in the framework. Furthermore, only 21 of the original 33 outcomes were evaluated as being relevant in the Mingei context. It is therefore not easily applicable to a digital transformation context.

The GLO framework is therefore not a perfect framework for application in the context of organisational impact and digital transformation. It was originally developed for the evaluation of learning activities in a museum education context and therefore lacks depth and relevance for a heritage organisation or professional skills context even though several indicators can be used to figure out what kind of learning experiences have been felt by museum professionals as individuals.

The digital transformation tools described in [the report available on the Mingei website](#) give an additional perspective on digital transformation indicators. Tools like [Europeana's value lenses](#) (developed specifically for digital heritage projects and outlining five areas of impact - legacy, utility, learning, community and existence) might have been a more fitting choice, though this also has its limitations (lack of detail and flexibility in application). At the time of writing, there are no agreed/standardised indicators at a European level with which to assess digital transformation. This was also not Mingei's task, though we hope that what we share will provide valuable insights into future indicator development.

Despite the shortcomings, the decision to apply the GLO framework was nonetheless suitable for the Mingei project because it helped to set out a framework in which to tackle the creation of the digital transformation case studies in light of no standardised indicators or frameworks in (digital) heritage.

3.2.4 Impact chapter #1 conclusions: challenges to organisational impact, processes of digital transformation and Mingei

To what extent did the tools and processes introduced by the Mingei project (and the impact evaluation work package) contribute to processes of digital transformation?

By applying the Team-Based Inquiry methodology, Mingei set in place a mechanism through which to constantly focus on the needs and experiences of heritage partners' key stakeholders. While we completed slightly fewer TBI cycles than intended, we saw that the process - of questioning, collecting data, reflecting and improving - created added value alongside the technical innovation processes that were also influencing the heritage partners. TBI is a tool that can answer, in a simple way, much bigger questions relating to key stakeholders and key questions facing heritage crafts organisations in the contemporary, digital, context.

Adapting and applying the Generic Learning Outcomes framework, while not perfect, helped us to focus and report on personal and professional outcomes experienced by the heritage partners. Using an extended version of the GLO framework, we identified skills and mindset outcomes that were experienced by the heritage partners.

- ➔ Impact was created by knowledge-sharing amongst the heritage partners, despite their very different crafts, professional and organisational contexts.
- ➔ The TBI cycles led to improved relationships and collaboration with fellow museum and project colleagues, and are likely to lead to positive impact in terms of collaboration with wider stakeholders.
- ➔ TBI cycles are an effective tool that helps the museum professionals critically assess their museum's and their practices in new ways, as well as to embed improvements.
- ➔ New or strengthened skills were identified in many areas, excluding digital skills, including working with technical partners.
- ➔ Many areas of knowledge and understanding were developed, including the interest in and understanding digitalisation.
- ➔ Mingei was inspiring in its digital approach, the new methods introduced (e.g. co-creation), and in stimulating future potential activity and application of what has been learned.
- ➔ There is evidence of positive attitudinal change, more confidence and a recognition of potential reputational impact.

- ➔ Mingei has inspired future activity, and some of the processes introduced in Mingei are likely to be used in future.

At the same time, we identified several challenges to impact.

- ✘ English language proficiency may not be of a high level amongst all heritage partner colleagues, meaning that some do not feel confident, do not take part, and responsibility may lie mostly on one colleague.
- ✘ Not being at the right level of responsibility or having the agency to make a change in an organisation.
- ✘ Lacking digital/technical colleagues/skills in the institution.
- ✘ When other museum staff are not involved in project processes (e.g. co-creation, TBI, communication and dissemination).

Alongside such barriers to digital transformation, there are also signs that digital transformation processes are slow (see also McNeilly and Markus, 2020), as identified in the following quote:

Mingei has increased the technological/cultural value of the...museum but I am not sure that it has transformed the opinion of the museum professionals over the need to adopt new technological approaches. [I am] not sure that we are mature enough to make such an adaptation.
Heritage partner response to the WP7 questionnaire (May 2022)

To conclude, reflecting on the first impact research sub-questions, we can say that the tools and approaches introduced by the Mingei project to the participating heritage partners - from TBI cycles to motion capture technologies - strongly contributed to processes of digital transformation, if we follow Europeana's definition of [digital transformation](#) (McNeilly and ter Burg, 2021) which consider digital transformation as both process and technical innovation.

4. Impact chapter #2: relationships with heritage crafts stakeholders

4.1 Introduction

It was a great experience to work with colleagues of all ages and nationalities, from such a broad spectrum, the world of craft being very open!
Heritage partner response to the WP7 questionnaire (May 2022)

Not all heritage partners had worked on international or European projects before. It was therefore the essence of Mingei to identify and promote the best ways of collaboration among all those involved and with other institutions identified and contacted along with the implementation of our tasks.

This second impact chapter assesses what has been learned through the co-creation process; what the impact of this is likely to be in terms of building new connections with heritage craft communities; and the extent to which the heritage and technical partners now feel empowered to co-create responsive and inclusive programmes with external crafts communities. It summarises the key points of the revised deliverable D7.2 to ensure continuity in reporting on what has been learned by the heritage partners in terms of working with and in the broader digital heritage crafts community ecology. It concludes by drawing out the key learnings from a programme of consultations with creatives and makers that helped to shape the Mingei protocol.

We identified the following research question that shapes this second impact chapter.

✓ Research sub-question

To what extent has the Mingei project supported the development of stronger or new connections or ways of connecting with wider heritage crafts communities, for longer term impact in terms of heritage crafts digital preservation and transmission?

We respond to this research question in the chapter conclusions.

4.2 Impact of the co-creation processes

4.2.1 Introduction to the Mingei co-creation approach

In Mingei craft/pilot partners, technology partners, research and design partners and external experts will work together, in co-creation, to develop new (technological) solutions to capture and share knowledge and skills for crafts. *Mingei co-creation living document (available on request)*

Co-creation was a key element of Mingei's approach to inclusively and in a user-centred way develop technology and experiences for cultural heritage contexts, specifically focused on the representation, presentation and preservation of heritage crafts.

While the Mingei co-creation approach has been [outlined and reported elsewhere](#), here we summarise what we have learned about its impact on heritage partners. We thus share a long-term perspective, as the co-creation stage of the project finished long ago, as opposed to, for example, the short-term perspective we took with regards to the TBI cycles. We should also note several things.

Firstly, it was clear from the data gathered (interviews and questionnaire) that most if not all partners were new to co-creation. The Mingei co-creation living document (p.g. 3, available on request) outlined that the heritage partners would be coached by Waag colleagues to lead co-creation processes themselves.

Secondly, the impact of Covid-19 on the planned co-creation approach was devastating in terms of the desired connections that could have been made through building rapport and connections face-to-face. In-person encounters were not at all or very rarely possible, travel was forbidden. The seven mindsets for successful co-creation (optimism, hands-on, experimental, critical, sensitive, fearless and flexible) (van der Vaart et al, 2022) are without a doubt almost impossible to achieve in full or in part in a crisis where traditional ways of working were turned upside down and when partners are unable to work together or share experiences in-person.

Finally, heritage partners were not necessarily able or prepared to host online co-creation workshops. Online facilitation requires key skills and the partners were not expecting to have this challenge ahead of them. Similarly, the stakeholders in heritage craft communities who were planned to attend were unlikely to engage in the same way in online formats.

In the next section, we summarise the impact created as well as outline the challenges encountered, drawing from the survey of the heritage partners as well as broader project insights.

4.2.2 Impact created by the Mingei co-creation approach

What worked well:

- It was valuable to have a space where multiple colleagues from across the heritage partner's organisation could attend to experience co-creation in practice.
- It encouraged new ways to think about problems.
- It was creative ('playful').
- It created a beneficial structure to kick off the beginning of the project, for those projects (CNAM) that were able to experience co-creation in person before the pandemic began.

Tangible results emerged from the co-creation approach, as follows:

- Following a co-creation approach, it was decided to re-enact the creation of a 19th-century object found in the collections of the museum: the museum collection featured not just the object but also the tools that had been used to manufacture it.
- Following a co-creation approach, it was decided that sound would be a valuable addition to the installations, something not previously considered by the technical partners.

What could be improved:

- While co-creation gave a new approach to the heritage partners, they are less likely to report that they gained skills.
- It was not inclusive of those who were less confident in their English skills.
- Sessions would have benefitted from an assessment of the context from which all those attending come from, as some of those involved may be less comfortable with certain approaches.

4.2.3 Final remarks on co-creation

Regrettably, the Covid-19 pandemic had a significant impact on the planned programme of co-creation and on its objectives to bring together all relevant stakeholders (including representatives of heritage crafts communities) to shape the development of the pilot exhibitions. Learnings can be drawn from the findings presented above about the preparedness of partners for offline engagement (which is more likely to be needed in the short to medium-term future, as the pandemic situation remains unclear). Though recent literature also comments and reports on the effect of the Covid 19 pandemic on intangible cultural heritage and heritage crafts (Stefano, 2021), more time is needed for assessing what has been learned and what the impact will be for individuals, groups and institutions alike.

That said, the co-creation cycles were not the only opportunity planned or realised for heritage and technical partners to engage more widely with heritage crafts communities. We discuss the impact of wider activity to support long-term and ongoing engagement with heritage crafts communities further below.

4.3 Heritage partner engagement with heritage crafts communities

4.3.1 What are heritage crafts communities?

The simplest description of a Heritage Craft community we could propose is people who are involved in or affected by a Heritage Craft in a shared way. *Mingei deliverable D7.2*

Heritage crafts communities include multiple types of stakeholders, including but not limited to practitioners (skilled craftspeople who have developed a certain level of knowledge and expertise around the craft), apprentices/trainees, and local communities who celebrate or promote the craft.

4.3.2 What have we learned through Mingei about collaborating with heritage crafts communities?

Heritage crafts communities are bound by issues of knowledge transmission, the safeguarding of the tangible and intangible heritage crafts and practices, the need to balance preservation and innovation in crafts practices, and collaborative decision-making.

In Deliverable 7.2 we outline ten steps that highlight tips, tricks, good practice and heritage crafts communities' challenges, that incorporates and extends the 2003 ICH definition of safeguarding intangible cultural heritage:

Ten steps that highlight tips, tricks, good practice and heritage crafts communities' challenges

1. **Introspection** (the current, past and future role of the crafts stakeholders, a lens through which to evaluate the relationship with the heritage craft)
2. **Identification** (of the relevant crafts community stakeholders)
3. **Research** (in collaboration and including the perspectives of crafts community stakeholders)
4. **Documentation** (the output of the research phase)
5. **Preservation** (the identification of priorities for preservation)
6. **Protection** (mitigating present and future threats)
7. **Promotion** (engaging other interested stakeholders in the crafts practice and knowledge transmission)
8. **Enhancement** (embracing innovation and the evolution of living heritage)
9. **Transmission** (how heritage crafts communities train new practitioners and the new generation)
10. **Revitalisation** (maintaining and growing significance, innovating for contemporary communities)

Working through these ten steps engenders considerations of human rights, ownership, and respect for legal frameworks like copyright, agency and appropriation.

4.4 Technical partner collaboration with makers and creative and crafts communities

4.4.1 Overview

The project partners in Mingei collaborated with several artists and crafts communities in the effort to improve and evaluate the Mingei protocol and supporting tools. As well as informing the protocol, the partners published several articles describing the processes of the craft they encountered on the project website and shared them via the project newsletter and social media.

A list of the consultations is provided below for review. The maker crafts investigated ranged from lace to woodwork to pottery.

- [In the Spotlight: The Artist Ioannis Stathoyiannis - Mingei](#)
- [In the Spotlight: local Industry "Handmade Cretan Woven" - Mingei](#)
- [In the Spotlight: Nikolaos Fasoulas, a traditional shoemaker from the mountainous village Anogeia - Mingei](#)
- [In the Spotlight: Women weavers from "Aretousa" Workshop](#)
- [In the Spotlight: weaving experts from CRETACOM - Mingei](#)
- [In the Spotlight: woodworker Nikos Manias - Mingei](#)
- [In the Spotlight: glassblower Thibaut Nussbaumer](#)
- [In the Spotlight: Limerick Lace](#)
- [In the Spotlight: artist Eirini Linardaki - Mingei](#)
- [In the Spotlight: ceramist Stelios Stamatis - Mingei](#)
- [In the Spotlight: The pottery experience at Keramikion - Mingei](#)

Below we report on the potential impact of this consultation and what it means for the legacy of the project in a reflective interview with Xenophon Zabulis (FORTH). In addition, through a short survey of technical partners as part of the final WP7 activities, we learned that technical partners also identified positive outcomes concerning how they might engage with heritage partners in future:

[Mingei] improved our background to be able to engage easier such partners in the future.
Technical partner response to the WP7 questionnaire (May 2022).

Reflective interview with Xenophon Zabulis

We asked FORTH's [Xenophon Zabulis](#) what was learned through the extensive programme of consultation with makers described above, and what it means for the future impact of the project and engagement with heritage crafts communities. This interview has also been published on the [Mingei website](#).

What was learned through this process of consultation?

The consultation informed the methodology of the Mingei protocol and our wider approach to the digital representation of heritage crafts. We approached makers to ensure that we understood, directly from their perspective, what they are talking about and the issues that are important to them. We wanted to ensure that the digital medium would not deprive them of expression and that it would ensure ownership. Only then could we proceed to discuss the potential impact of the digital representation of heritage crafts, such as new materials and hybrid art (e.g. see the interviews with Stathogianis and Linardaki listed above).

How did it influence the development of the protocol?

The consultation helped us by placing emphasis on several activities. Firstly, doing preliminary research with secondary resources to know the topic better before you meet the practitioners, including at least the local history of the place and the community to visit. Secondly, focus on getting a perspective not easily found in the literature. Thirdly, digitising everything and editing later. Finally, previewing digitisation assets on the spot with practitioners and asking their opinion on what is important to show.

How did it change how technical partners might work with these communities in future?

The need for data that more closely represents the sensations and ideas that the practitioner uses is strengthened. Technically, it means that we need to measure force, chemistry and time to reflect the physics of processes, in light of new materials and sustainability considerations. But it also includes the task of gaining a better theoretical understanding of how the mind negotiates with matter in making useful and beautiful things.

Was it a valuable experience?

For me, yes and I hope the same applies to everyone that worked on the project. Community knowledge was served by Open Access in all project publications. European Commission resources were increased, enhanced, and valorised through investment in Mingei.

What were your expectations and were these met?

Not all expectations were met. We would need more time to ask all the questions that we want to, but we are using this to inform our aspirations for future research.

What were the creative people's expectations of the protocol?

To be remembered, first. To make income, second.

4.5 Impact chapter #2 conclusions: tangible benefits and the importance of engagement with heritage crafts communities

To what extent has the Mingei project supported the development of stronger or new connections or ways of connecting with wider heritage crafts communities, for longer-term impact in terms of heritage crafts digital preservation and transmission?

While change cannot happen overnight, Mingei's emphasis on collaboration and partnership working is likely to bring about new ways of working together across functions and competencies, strengthening networks and promoting cross-disciplinary understanding and knowledge which can, in turn, help the CHIs tackle future challenges, and reinforce their attractiveness in front of the public and audiences in the "experiences market".

In our analysis presented above, we learned that co-creation, despite the challenges of using this in the pandemic context, brought about at least several tangible benefits and innovations to the pilot exhibition development process. By adapting a process for heritage crafts communities' engagement (the ten steps set out in D7.2) we have put in place a process with which the heritage partners and other CHIs can embrace relationship-building with crafts communities. Drawing on the TBI and co-creation methodologies that were introduced to heritage partners as a result of Mingei, we can argue that having these tools in the organisations' and each professional's 'toolbox' is likely to lead to better outcomes in future in terms of heritage craft communities.

We learned that the challenge of not being able to engage directly and in person with heritage craft communities as a result of the Covid-19 pandemic emphasised the importance of building and maintaining these relationships. Although this was not an intended outcome of Mingei, to conclude, we are certain that, having participated in Mingei, both technical and heritage partners alike have experienced positive outcomes relating to how they work together and with wider heritage crafts communities.

5. Impact chapter #3: future impact and legacy

5.1 Introduction

'Having [crafts] knowledge on the [Mingei] Platform is not the goal, but the goal is also to exploit it, meaning that the presentation modalities that we build can help automate the process of creating educational materials, creating demonstrations, and so on'. *Xenophon Zabulis (FORTH) at the Mingei Day online seminar*

The value of the craft production process has changed, notably from the pre-industrial revolution context to a contemporary context of tourism, as well as economic and social impact. Mingei's goal has not been just to have the content on the platform but to allow and encourage its exploitation. This section sets out what we have learned through applying the Mingei protocol and creating the Mingei Online Platform (MOP) (and other tools, approaches and products) in terms of future exploitation and potential for impact and legacy. It summarises and builds on what is presented in Deliverable 8.3 in terms of reporting on the project exploitation and its potential impact.

We first set out some criteria with which we can assess impact, drawing on the concept of replicability and generalisability, after which we set out a summary list of the Mingei products, approaches and tools that could and can be exploited during and after the project. We then report on what we have seen in terms of their exploitation by key stakeholder communities: heritage professional training; creative industries; interdisciplinary research and collaboration; accessibility; training for future heritage crafts practitioners; immersive experiences for crafts museum visitors; edutainment including gamification; data publication on open scientific and heritage reuse platforms; broader European competitiveness through strengthened CHIs, increased understanding of Europe's heritage crafts, and soft power; and finally, sustainable tourism and local destination development and management.

We set out a final research question to guide our analysis of this third impact area.

✓ Research sub-question

What might the potential impact and legacy in terms of the Mingei project be, when considering the possibilities of reuse and the future exploitation of the Mingei tools, approaches and products?

5.2 Replicability: criteria for assessing future impact

The replicability (and the reuse potential) of a product or technology development can, where necessary, be judged from a single-use case by assessing the ease and number of contexts with which it can be reused more generally in future.

In Mingei, we were able to apply several scientific approaches for each step of the heritage craft process and combine the results into a single representation - the Mingei Online Platform (MOP). The value of this approach became evident both in the craft understanding phase, where several approaches to studying social and historical context were applied and in the data collection step, where several scientific methods were used for data acquisitions.

The process was relevant for all three crafts, despite their differences and the resulting heterogeneity of the results. The MOP has therefore been proven sufficient as a representation process. Another supportive finding for the replicability of this methodology, and an indicator of future uptake, was that by detaching the representation of the craft from its presentation, multiple presentation instances could be created from different technologies (listed below). Developers of different presentation layers could apply the exporting functionality of the MOP and in doing so, judge the most appropriate way of craft presentation (for example, a potter might choose to give more emphasis to the gestures on the pottery wheel, while a textile producer might focus more on the motifs used). Finally, the included web-based presentation modalities in the MOP allowed the direct preview and dissemination of the represented knowledge online, leading to wider awareness of the traditions of the craft.

5.3 Generating impact through exploitation and reuse

The potential and already evident exploitation of Mingei commercial products are elaborated in D8.3. In this section of this report, we assess the potential for the longer-term impact of Mingei-related products. The complete collection of final exploitable products of Mingei and their exploitation potential is presented in D8.7, and can be summarised as follows:

- Mingei representation protocol and tools.
 - **Mingei Online Platform:** A web-based authoring platform for the representation and presentation of the tangible and intangible dimensions of HCs.
 - **Mingei Crafts Ontology (CrO):** An ontology for the representation of the tangible and intangible dimensions of HCs.
- Mingei protocol tools.
 - **Human Motion Editor:** A visual editor for the synchronous editing of video recordings and Motion Capture files for the implementation of gestures datasets.
 - **Mingei Human Motion Artistic Visualizer:** Human Motion Visualisation in static media using 2D visualisation concepts inspired by arts.

- **3D models annotator:** An software for multimodal annotation of 3D models.
 - **TooltY:** A platform (TooltY) to create 3D visualisations regarding HC processes and techniques.
 - **Mingei Ultra High-Resolution Surface Scanner:** Hardware, Algorithm and software for the ultra-high-resolution scanning of surfaces.
- Mingei presentation technologies.
- **Virtual Humans:** A collection of Virtual Human Models implemented for each pilot site.
 - **Virtual Human Narrations:** A methodology for the development of VH narrations and a collection of Mingei narrations for the pilot sites.
 - **Virtual Human Sign Language Narrations:** A methodology for the development of VH narrations in Sign Language and a collection of Mingei narrations for the pilot sites.
 - **Craft workshops:** A methodology for the multimodal reconstruction and modelling of Craft Workshops and exemplars developed in Mingei for the Glass and Mastic pilot.
 - **Craft demonstrations:** A methodology and exemplars for kinematic craft demonstrations by Virtual Humans.
 - **Abstracted Craft demonstrations:** A methodology and exemplars for abstracted craft demonstrations in 3D.
 - **True AR augmentation of physical spaces:** A methodology and exemplars of integrating Virtual Humans in physical spaces acting as museum narrators and craft demonstrators.
- Mingei presentation modalities.
- **Mingei Mobile Application:** An application for Mobile devices that allows users to experience Mingei crafts offline and when visiting the museum.
 - Storytelling application.
 - **Mingei Artefact Augmentation Application:** An app capable of localising itself in a specific location of a Museum and augmenting the space with hot spots appearing for the camera of the tablet. In each hot spot, one or more stories can be narrated through Virtual Humans.
 - **Mingei Artefact Augmentation Application:** A handbag that stands both as a woman accessory and as a contemporary craft creation that can be experienced to reveal its unique history and identity.
 - **Museum Guide:** A museum guide application to augment museum experience through video narrations and presentations by Virtual Humans.

Mixed Reality Craft Training: A training application that integrated 3D demonstration by Virtual Humans within the virtual workshop and gesture sonification to augment the experience of visitors while mimicking craft gestures.

- **Craft Training through gestures sonification:** A methodology and exemplars for gestures sonification for craft training scenarios
- **Mini-games:** A collection of mini-games for playful integration with, and learning of, craft concepts.
- **Exploration Game:** A Role-Playing Game that provides information regarding the historic period of the mediaeval occupation of Chios and more specifically regarding the socio-historical context of mastic cultivation and the creation of the first settlements that resulted in the formulation of the so-called mastic villages.
- **Airborne!:** An immersive flight simulator.

5.4 Uptake in heritage education and training: Mingei Online Platform (MOP) DigiTraining

5.4.1 Setting the (impact) scene

FORTH coordinates the DigiTraining project on Digital & Audiovisual Capacity Building for training CH professionals and has a network of 83 CHIs that have been trained on digital capacities using the Mingei Online Platform for context documentation (all CHIs) and the Mingei craft digitisation and presentation solutions (ethnographic CHIs). Mingei has aimed to provide a systematic and cost-efficient protocol for the digitisation and the presentation of tangible cultural heritage collections and sites, together with their intangible dimensions.

Using the Mingei protocol widens heritage institutions' access to the opportunities of new audiovisual technologies, primarily because it can simplify and democratise their use by non-technical experts, such as the IT department of a small or medium-size museum. The ultimate goal or impact of Mingei is the facilitation and encouragement of the reuse and creation of new content and experiences for CHIs and the wider CCIs. The Mingei heritage partners and pilots exist as diverse case studies to inform others.

5.4.2 Creating impact through DigiTraining on the MOP

The MOP and Mingei protocol were introduced to 83 diverse heritage institutions through the [DigiTraining Creative Europe project](#). The [participating organisations](#) were selected after an open call based on their potential, size and response to the call for participation. Digital maturity was generally diverse, though the majority of those participating had lower levels of digital maturity. Training on the MOP has enabled these heritage institutions to see the potential of digital technologies for creating, managing, making accessible, and disseminating digital collections. The adoption of new technologies facilitates the evaluation, improvement and further deployment of digital approaches in a museum context (akin to the processes inspired by the TBI cycles). The activity aimed to increase the capacity to organise and increase the quality and quantity of metadata so new digitisations could be aggregated to EU infrastructures, such as Europeana, and enhance their visibility and

online presence of the respective CHIs. The training included the representation of new content, in terms of digital assets and organised Semantic Web compliant knowledge entities, based on international standards for the documentation of cultural heritage (CIDOC-CRM, ISO 21127:2006), as well as state-of-the-art in interaction, narratives and storytelling.

5.4.3 Creating impact through the MOP through interoperability and connections to Europe's common data space for cultural heritage

The documentation of digital assets in Mingei conforms to standard European digital preservation standards and accessibility requirements. All assets, digitisations and narratives are being hosted in a linked data repository, and include links to relevant assets hosted in other repositories. The standards used are compatible with the CIDOC-CRM and the Europeana Data Model (EDM), the de-facto standards for describing and contextualising cultural heritage artefacts. An extensive and tailored 'Digital Transformation Syllabus' was created for the DigiTraining opportunity (overview presented in Appendix 2). This presented the core components, standards and approaches developed, used and advocated by the Mingei project.

5.4.4 Creating impact through future uptake of the MOP by European CHIs

The CH research community has been engaged in Mingei's community portal. Through this network, and showing the success of the DigiTraining opportunities, the consortium has already received invitations for individual collaborations to assist CHIs in pertinent tasks.

5.5 Creative industries exploitation and impact

The factors that influence the decline of traditional crafts can be summarised as the reduction of market demand for traditional handmade goods, competition with imported mass-produced products from developing countries, shrinking of the workforce as skilled craftspeople get older, the globalisation of the economy, the rise in the cost of raw materials and disruptions in the supply chain. At the same time, the globalisation of the economy, branding policies, advertisement and product presentation in media may lead to the false perception that craft products are associated with the past, thus making them less attractive to young people. This problem has financial dimensions as well: because of the lack of interest in and support for craft-related entrepreneurship, fewer people are exploring it.

However, some positive signs may give rise to an increase in handmade products in the future. For example, do-it-yourself maker culture, the emergence of digital fabrication at home (e.g. 3D printing) and hybrid forms of making, which merge the traditional with the contemporary, are giving life to new micro and small businesses, often in rural or less populated areas. At the same time, the rising need for individuality, sustainability and quality in consumer societies (see for example the example of [Shetland Wool Week](#) explored on the Mingei project website) has increased the demand for unique, customised products. In this context, a repositioning of craft skills, techniques, patterns and materials is possible by augmenting them through the integration of digital technology. In this article, we argue that this may lead to a new form of craft-based innovation, which can also be promoted through ethical approaches to sustainability and local production.

5.5.1 Mingei craft product enhancement through personalisation, contextualisation and branding

Mingei provided the technology to link individual craft products with unique identifiers to bind them with digital content, certificates, and applications available online, using their appearance or by embedding visual codes in their design and maturing preliminary work (Partarakis et al., 2021). These online items can be linked through MOP to third parties. Registration of individual artefacts with secure, unique identifiers will take place in the MOP. Figure 5 below (and [this online demonstration video](#)) show the digitally enhanced woven handbag which was made possible and inspired by the Silk pilot.

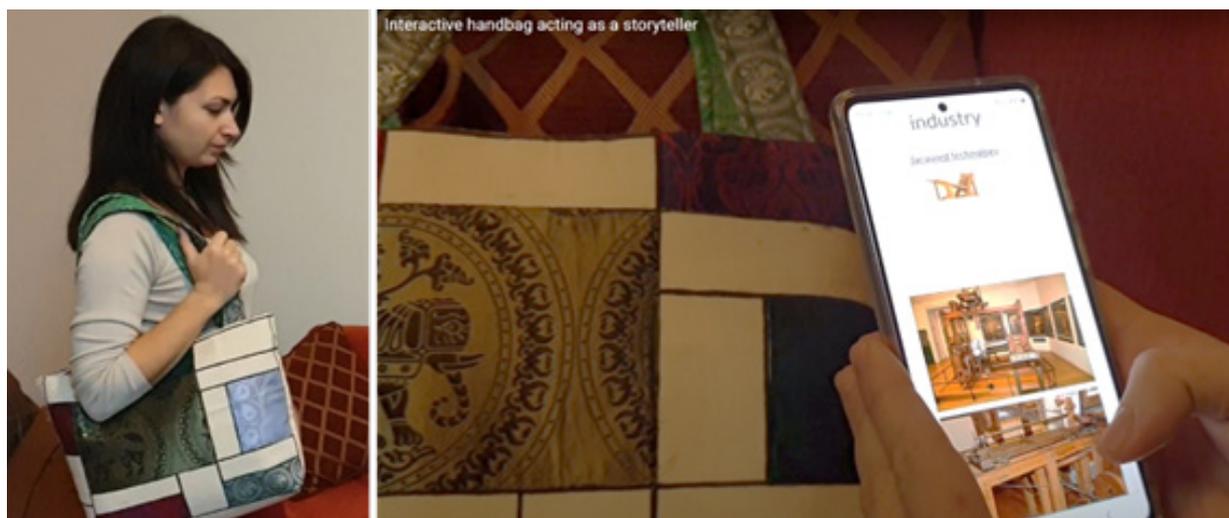


Figure 5. A digitally enhanced craft product (woven handbag).

Mingei has increased the uniqueness of artefacts through accompanying multimodal narratives that serve the contextualisation and personalisation of objects. This provides the technological infrastructure for branding whether this regards a practitioner or a community. Digital storytelling technologies empower the maker movement to create original, contemporary, handmade products inspired by art, culture and tradition and to revive patterns, symbols and motifs. In this changing world, we aspire to revive and present the cultural significance of patterns, symbols and motifs as bearers of tradition, collective memories and stories. Mingei proposed an approach that binds contemporary craft products with the cultural context of their depicted patterns, symbols and motifs through stories that explain their elements.

As such, interest in the commercial part of AR is vivid in this research work, with the potential to exploit its outcomes in mixed reality (MR) settings. Mingei made it possible for AR technology to be used to enhance the capacity of the contemporary cultural heritage sector to deliver stories and, through stories, enhance their meaning - transforming them from aesthetic objects to objects that are bearers of stories and memories. With this approach, we expect that new forms of bonding with cultural heritage artefacts will be made possible, thus empowering the capacity of companies exploiting traditional crafts to innovate and reach new target audiences.

5.5.2 Further creative valorisation opportunities

There are further valorisation opportunities that are made possible through Mingei, for example, through tutoring services, marketing digital assets and designs, fabrication services and consultation.

5.6 Supporting interdisciplinary scientific collaboration and new research insights

Collaboration across scientific disciplines is challenging since different scientific approaches, technical tools and research methods are applied in different contexts. In the Mingei project, we learned that the MOP, as a single point of representation of research data, greatly enhanced the collaboration of the team, as it allowed different scientific disciplines to report and document results under a uniform semantic representation.

5.6.1 Synergies with external European innovation projects

Mingei participated in the DT-TRANSFORMATIONS-12 cluster organised by the European Commission, with ongoing collaboration with [VAST](#), [SPICE](#), and [SilkNow](#) in the representation of contextualisation narratives and controlled vocabularies. [Mingei](#) has established synergy with the Europeana-funded [CRAFTED](#) project as a mechanism and opportunity to provide craft-related digital assets for ingestion in Europeana. This is advantageous because it shortens the ingestion procedure and removes the need to create Memorandums of Understanding with individual national aggregators. Independently, FORTH has signed a contractual agreement with the Greek national aggregator [Search-Culture.gr](#).

5.6.2 Innovation in local/national heritage crafts contexts

Due to the reputation of Mingei, FORTH now participates in two national projects under the Greek Ministry of Culture on modern design and art inspired by traditional crafts, namely "Digitisation of the [Branding Heritage](#) collection of fashion design items" and METartTUM on the Art of Dry Stone Walling, Knowledge and Techniques [UNESCO inscription [13.COM 10.b.10](#)]. Dry Stone Walling is used to inspire contemporary artists and in studying old professions, in particular Transhumance, the seasonal droving of livestock along migratory routes [UNESCO inscription [14.COM 10.b.2](#)] related to the production and treatment of wool.

5.6.3 Innovation in applied research

FORTH will extend the innovative technical work of Mingei in high-resolution surface scanning, as in Figure 6 where a banknote and silk fabric digitisation (see [the demonstration video](#) on Youtube for more information) are made available to the 20 Kpix/cm² industrial standard used by texture scanning services, such as [Arroway](#), [Vis](#), [Texture Supply](#), [Textures.com](#), to 1 Gpix/cm². The implementation of the method has been reported in Zabulis et al (2021).

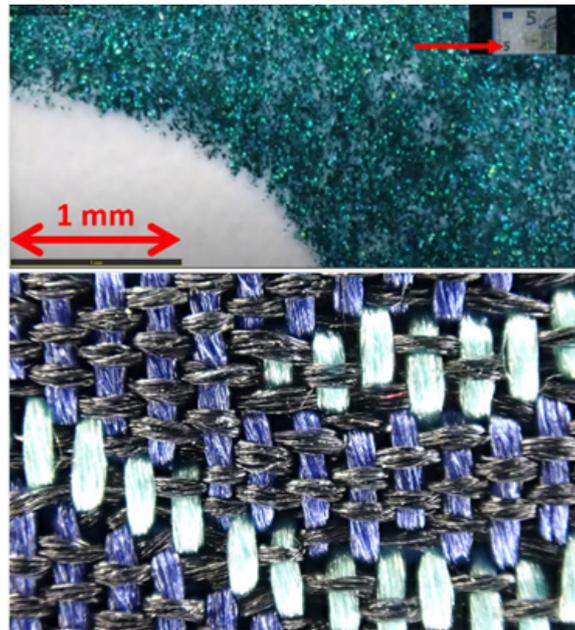


Figure 6. Results of the surface scanner developed by FORTH in Mingei.

5.7 More accessible heritage crafts representation

5.7.1 Sign language in Chios

New media pose new interaction requirements and new considerations in terms of accessibility. The need to address the requirements of a diverse museum visitor population raises accessibility challenges that must be addressed, as well as opportunities to explore new methods of presentation.

People with hearing loss or hearing disabilities face barriers to understanding both written and oral information. To overcome such barriers, Mingei proposed (in Deliverable 5.10) a cost-effective and creative methodology for the implementation of Virtual Humans (VHs) capable of narrating content in the context of online and on-site CH experiences. Figure 7 illustrates the pipeline of authoring Sign Language content.

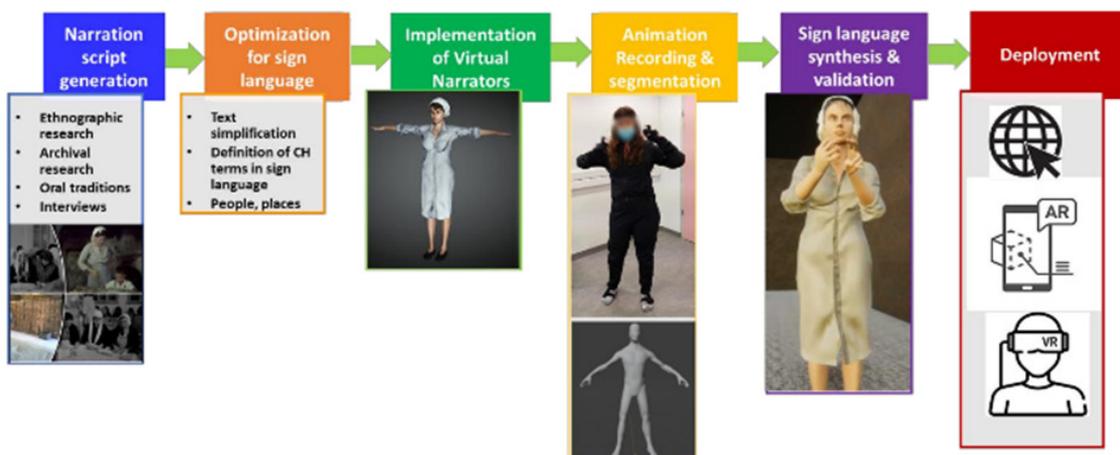


Figure 7. Authoring sign language narrations.

The methodology is rooted in advances in motion capture (MoCap) technologies and VH implementation, animation, and multi-device rendering. This methodology is employed in the context of a museum installation at the Chios Mastic Museum where VHs are presenting the industrial process of mastic processing for chewing gum production. The proposed methodology does not pose any constraints on the development platform/technology. The signing VHs can be integrated into any 3D-enabled software technology. Furthermore, the output can be easily ported (converted at the source code level for use in another type of operating system) to support WebGL technologies for web-based integration that supports interactive 3D information. VH animations can be rendered to video to be hosted by any other application that supports video rendering. Figure 8 shows an example from the installation at the Chios Mastic Museum.

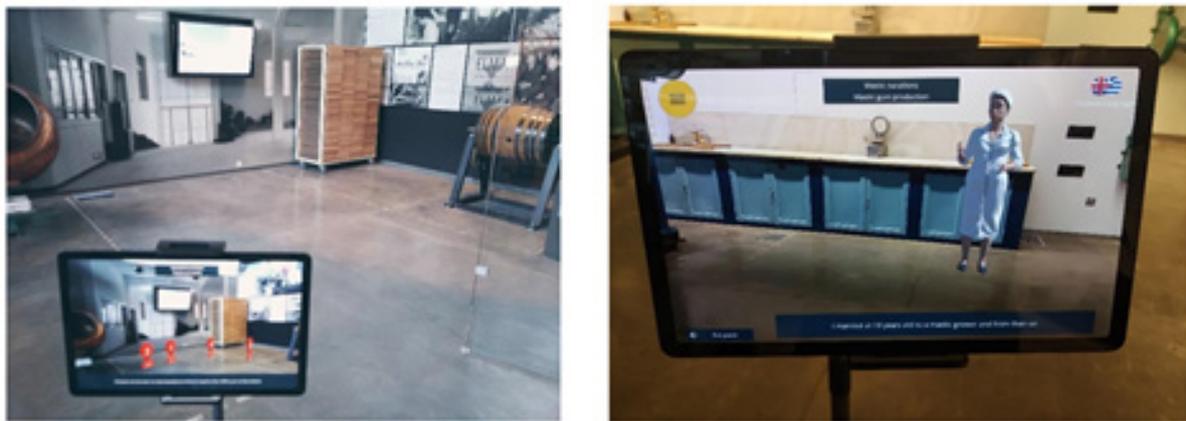


Figure 8. AR presentation of sign language narrations.

The proposed methodology allows the creation of a set of sign language phrases and vocabulary that can be reused across projects, thus reducing the cost of acquiring sign language recordings. In terms of future impact, Mingei is a novel approach to making multimedia presentations and crafts narrations available to those with hearing disabilities. The technology developed, tested and evaluated can be utilised to present any type of narrative, including but much wider than crafts heritage.

5.7.2 Audio guides and blind visitors in Krefeld

In the evaluation of the pilot apps at HdS, we learned that the technological innovations presented were likely to have a positive impact on the museum's accessibility for blind audiences. As a representative of a local organisation for disabled persons observed, *"it is now possible to recommend that our visually impaired members visit the museum as individual visitors because all the impressions are audibly well-communicated...Deaf persons as individual visitors also profit from the new technology because they can access the guide text themselves."*

5.8 Heritage crafts training for future crafts practitioners

Training material for apprentices interested in learning the craft was compiled for each pilot. This material comprises demonstrative digital assets showing the details of tool grips and gestures, and the representation of the craft processes and schemas in the MOP.

In training contexts, repeated practice and attention to the imagery produced during acting are known to foster learning. This reduces the risk of “free-hand” operations requiring tacit knowledge, similar to music practice. As such, the generality of approach in the Mingei pilot installations can be replicated for more crafts practices.

Through interviews with a technical partner, we learned that the pilot installation presented a version of crafts processes that were more suitable for the public audience. In the laboratory and testing context, crafts practitioners were able to see the training potential for this more extended version of the pilot exhibition technologies. In future, it may be appropriate to explore more how a crafts training context and process (using the digital transmission of techniques) could be built into a museum presentation and exhibition context (e.g. learning from the Museum Boijmans [Hand Made - Long Live Crafts](#) example explored on the Mingei website and in D7.1).

However, even beyond the physical museum location, there is a strong potential for tutoring and technical assistance to facilitate learning from practitioners in highly specific locations or even in remote apprenticeship settings. At the same time, the digital innovations introduced to support the preparation of educational onsite/hybrid workshops coupling introductory crafting experiences with thematic and cultural tourism.

5.9 Immersive experiences for visitors to crafts exhibitions

Craft training is intended to demonstrate craft activities to visitors in the museum context, thus providing a more immersive experience and the opportunity for the visitor to experience some of the demands and finesses of the heritage craft’s processes, and to virtually become a craftsman, even just for several minutes.

To do so, the visitor stands in front of the installation and follows the instructions provided on a screen that guides them to mimic craft actions. The training application uses gesture recognition. For feedback, each one of the gestures was mapped to an abstract sound that was affected by the success factor of the user performing a gesture. Below we explore the training examples used in the HdS (mastic) and CNAM (glass) pilot exhibitions.

Mastic. An overview of the experience of the Chios pilot exhibition is shown in Figure 9. Since the movement of the expert does not have details concerning the dexterous movement of the fingers, the video of the expert mastic cultivator has been placed on the top left of the screen for the viewer to watch, while in a bigger panel in the middle of the screen, there is the real-time recording of the video with the skeleton extracted from the OpenPose framework. In the bottom image, we see a museum visitor using the technology and experiencing the physical demands of the craft's gestures.

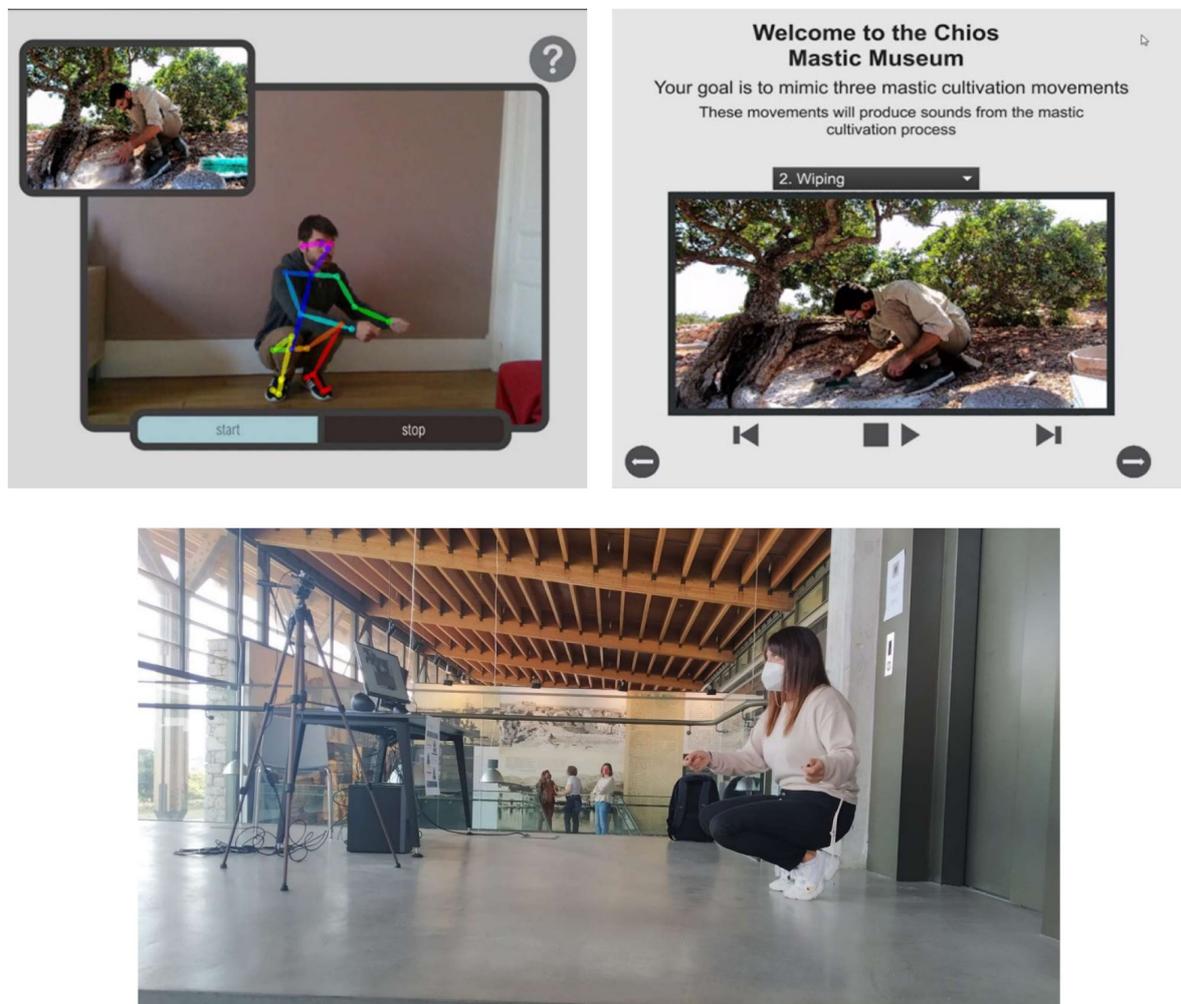


Figure 9. Craft experiences for museum visitors through replication of the gestural know-how of the mastic cultivator.

Glass. The installation uses a big frame with the video of the expert glassblower appearing, while a smaller one with the video of the visitor is placed on the top-left of the screen. The user can either start experimenting directly or choose the question mark sign on the top of the installation screen to see the instructions before starting imitating. An instance of this instruction screen is shown in Figure 10. On the screen, the user can see a video of each one of the gestures before starting experimenting. When the gesture imitation starts, the progress bar on the video becomes red. The speed of this bar becoming red concerns how accurate the gesture recognition results are.

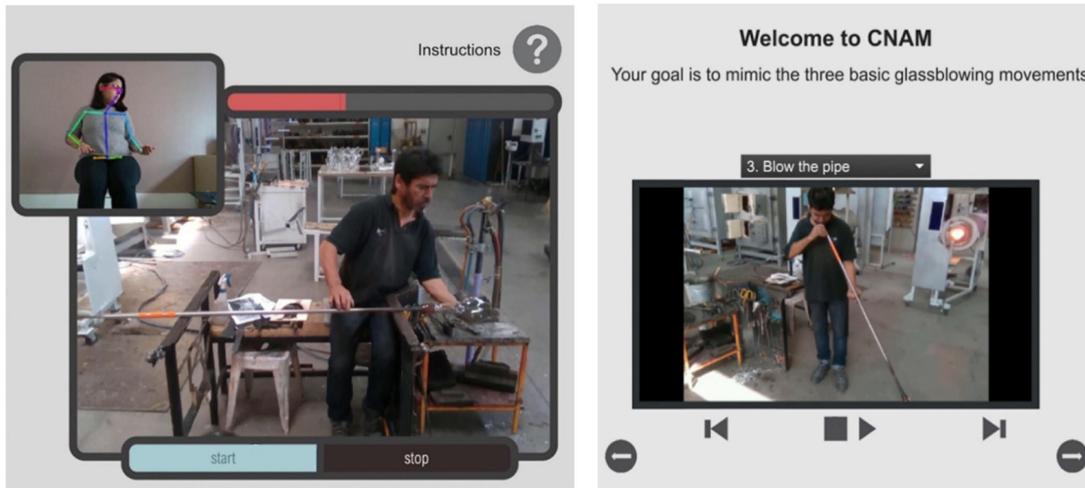


Figure 10. An instance of the main screen of the interactive installation, (top) and user view (bottom).

5.10 Learning through edutainment and gamification

Taking the immersive experience of the pilot exhibitions one step further, VH animations were used for the implementation of the 3D representation of crafting activities, available for inspection and learning by example (see Figure 11). The gestural know-how of the captured craft practitioner is used for replicating the practitioner movements and for setting digitised tools in motion.



Figure 11. Demonstration of the mastic cultivation activities by a VH.

Online educational games were created in the form of mobile applications, available on Android and iOS. For Silk, two games specifically designed to explain both the design of a pattern for a Jacquard loom and how the punching card is created from the paper design were created as shown in Figure 12. Some inspiration came from looking into more “traditional” (non-digital) ways of learning through direct engagement with creative and heritage crafts (Robertson, 2019).

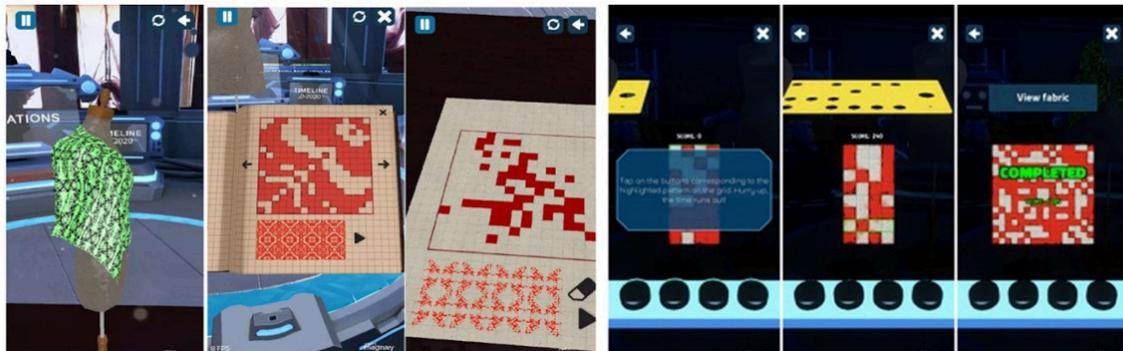


Figure 12. Design pattern game (left) and punch card game (right).

For Mastic, one of the requirements of presenting the craft was to display its seasonality. It became evident that a guided tour was a perfect example of the process of the year-long craft. Visitors to the rural space outside the museum can experience mastic cultivation in the field through their mobile devices. Figure 13 presents an example of the pilot mobile app screens.



Figure 13. Mobile app games and guided tours.

Information on geographical location and context shows the environmental aspects affecting craft practice and development. We developed Airborne, an immersive flight simulator allowing users to fly over various mastic villages in Chios. During the flyover, users can stop at each village and retrieve multimedia and text information related to those villages as shown in Figure 14.



Figure 14. Airborne indicative screens.

The potential impact of edutainment and gamification for wider audiences (including potential future practitioners and crafts apprentices) is that Mingei's approach presents a way to engage prospective practitioners, generate interest in the craft, and counter the declining number of practitioners, which is the main threat to craft transmission and preservation. Gaming contexts are selected in particular to focus the engagement of young practitioners, as craft practices are learned and adopted more easily when young.

5.11 Publishing digital assets to facilitate wide future awareness and reuse

Mingei supports the growing awareness and promotion of European crafts and crafts identities to counter the "falling demand or decreasing markets for craft products are partially due to a lack of awareness from potential customers that the craft exists" (Heritage Crafts, no date). The MOP provides a preliminary inventory of content of three very different European crafts, pointing to the History of Art and art movements, identifying communities that developed techniques and designs and traditions, memories, and values, and highlighting common European culture emerging from a diverse yet shared crafts tradition. To facilitate the wider reuse of the digital assets created throughout the Mingei project, data are being shared widely in ways and on platforms that encourage wide reuse for the greater public, research, education, and creative and economic benefit.

Zenodo open access repository

More than 10 public datasets were produced and stored in the Zenodo OpenAIR repository. All papers and datasets are stored in the Zenodo repository under a Mingei page community and all the funding information is provided. All Mingei publications are available in Open Access and through the Mingei website.

Sharing of digital assets on the Mingei Open Platform and Europeana

All of the collected digitally in Mingei is available through the MOP. The process of ingesting the assets from the Mastic pilots in Europeana has been initiated with the Greek National Aggregator (www.SearchCulture.gr). The collaboration with CRAFTED (Europeana Generic Services project) will support the ingestion of the rest of the assets. Moreover, the MOP provides the EDM description of all assets as well as the possibility of licensing each asset with any of the licences supported by Europeana. As such, new assets inserted in the MOP can be also shared under the same scheme.

Digital Preservation and Open Data Dissemination

The digital assets hosted in the MOP repository are provided online in conventional and open formats. Each asset has a unique Internationalised Resource Identifier (IRI) to be directly integrated by third parties. Our knowledge is available on the Semantic Web via the SPARQL endpoint by the MOP. Furthermore, to ensure compatibility with online knowledge sources, definitions of terms are imported to the MOP by linking to terms from the Getty Arts and Architecture and the UNESCO thesauri. For further exploitation of the semantic knowledge encoded in the MOP, a Europeana Data Model (EDM) export facility has been also been implemented allowing (a) the export of data in semantics compatible with EDM format and (b) the formulation of SPARQL queries to the MOP SPARQL endpoint to receive EDM-formatted results.

Web-Based Access to Knowledge and Narratives

The represented knowledge network is available through the web and MOP in hypertext format. Semantic links are implemented as hyperlinks that lead to the pages of cited entities. Contents are also organised and presented thematically, per class type. Documentation pages contain links to digital assets, textual presentation of metadata, and previews of the associated digital assets. For locations and events, specific User Interface (UI) modules are provided. For locations, embedded, dynamic maps are provided through OpenStreetMap. Timeline and calendar views are available for events.

5.12 Supporting European competitiveness and soft power

The EU has strong and vibrant cultural and creative industries. These are not only essential for Europe's cultural diversity, strengthening social cohesion and increasing Europe's attractiveness internationally. They are among the continent's most dynamic sectors. According to Eurostat figures, cultural and creative industries employ 8.7 million people in the EU, equivalent to 3.8% of the total workforce, representing 1.2 million enterprises. [European Commission](#).

The fact that Mingei stems from Europe has a potentially very positive impact on Europe's prestige. Moreover, Mingei is centred on the support of organisations (CHIs) that are the ambassadors of European culture, heritage and history and the open access and public-first perspective will therefore contribute to the widening of international access to and understanding of the diversity of Europe's culture and heritage crafts, particularly those that, until now, have had to be experienced and viewed locally. Through the proposed representation on the Mingei Open Platform, we aspire to provide support for the importance of European culture - and the technical innovations that accompany this - on the international stage as a 'soft power' that provides benefits for the EU and its Member States in their relations with the wider world.

The creative and cultural industries make an important contribution to the economy and the creation of jobs, as noted in the paragraph quoted at the beginning of this section. Museums and CHIs are an essential part of this reality. This means that Mingei represents a most timely and effective initiative to reinforce the capabilities and skills of many institutions and their staff, to access and make the best use of these and other funding channels addressed to "digital transformation".

5.13 Sustainable tourism and local destination management

The MOP supports the promotion of products and local culture through realistic online previews, contextualisation content, and guides to craft-related thematic tourism destinations. Cultural tourism industries can add new creative and introductory experiences to craft in collaboration with local practitioners, using local materials, in compliance with green growth policies, distributing tourism load and engaging new thematic tourism audiences. Regional authorities are welcome to collaborate with the consortium and in particular, FORTH and CNR which developed the MOP to add their local content to promote local identity, materials, products, and tourism services. Contextualisation stories to be retrieved by the MOP regarding ICH craft dimensions, Art History, history, technological history of the craft, local tradition and cultural tourism, and local products and materials, are usually attached by the producer. Citizens, regional authorities, and governmental bodies can use this resource to promote local products and tourism destinations to motivate the preservation of local crafts and the offering of craft-related experiences.

Furthermore, craft products exhibit a local identity that is directly linked to their reputation, external appearance, and know-how for making them. Promoting crafts, thus, highlights the need for a sustainable relationship with the local environment (minerals, fauna, flora) as a

provider of local materials. Digital dimensions attached to artefacts will provide instructions for their repair and, most importantly, will contain certificates of materials and composition indicating whether they comply with the sustainable use of the environment. The regional promotion of local crafts enhances local cultural tourism and, also, alleviates the load from locations suffering from over-tourism. Policy makers and governmental bodies are equipped with sustainable and practical green growth tools, regional product and material promotion, increased regional reputation and reinforced tourism, new jobs stemming from material savings, and new professions to accommodate the increased possibilities that digital aids offer.

5.14 Impact chapter #3 conclusions: Mingei's potential impact and legacy for stakeholder groups

What might the potential impact and legacy in terms of the Mingei project be, when considering the possibilities of reuse and the future exploitation of the Mingei tools, approaches and products?

Although the exploitation of Mingei's products, approaches and tools is discussed further in D8.3, we have analysed here (with an impact lens) the potential legacy that can be created as a result of the Mingei project for diverse stakeholder groups. Mingei's open-source approach, combined with an explicit understanding of the interdisciplinary reuse potential of the technical tools and approaches developed, has set in place strong conditions for future impact. It was not the purpose of this report to assess impact but rather to strategize and plan to create longer-term impact.

Responding to the research question, and in conclusion, we can say that the potential legacy of the project is strong and that future heritage crafts organisations and communities, as well as wider CCIs, heritage institutions, policy-makers, tourism agencies and local governments, technical partners, and educationalists including museum mediators, are among the many stakeholders who may benefit from the approach taken. Furthermore, drawing on the findings of the [Waag TBI cycle](#) (reported on in impact chapter #1) on how to create impactful project communication and dissemination, we now have at our disposal suggestions and tips on how to strengthen even further post-project activities and the conditions for future impact.

6. Conclusions - Mingei, digital transformation, reuse and exploitation, outputs and impact

✓ Research question

What is the impact of the Mingei heritage partners embracing digital transformation in the context of Mingei and the digitisation of the tangible and intangible aspects of heritage crafts?

The three main impact chapters of this report consider the impact of the Mingei project as three different but complementary impact areas. The first considers the digital transformation of the three heritage partners involved in the project. The second assesses the potential for impact through new and strengthened connections with heritage crafts communities. Finally, the third assesses impact through the potential legacy that could result from the exploitation of Mingei's products, tools and approaches. An impact-focussed perspective from the conceptual and proposal stage onwards has given the Mingei project a clear focus in terms of measuring its impact and forecasting its potential legacy, while so far as possible setting in place the conditions to deliver this legacy.

Outputs

Measurable results include:

1. Scientific impact:
 - The consortium contributed with more than 35 scientific publications in prestigious journals and conferences in the area of Cultural Heritage. All the papers are in Gold or Green Open Access.
 - All publications have been uploaded on OpenAir Zenodo. Furthermore, community pages were created in Zenodo and ResearchGate for the Mingei project and all publications are listed on these pages (besides the Mingei project website).
2. Number of tool adoptions by stakeholders: 10
3. Number of digital assets integrated: 10,000
4. Number of new digitisations: 2,000
5. Number of heritage crafts digitised: 7
6. Number of adopted or curated content and digital assets by international repositories: 10 (but many in backlog)
7. Contribution to public knowledge (i.e. number of Wikipedia entries or edits): 3

Figure 15. Summary overview of the Mingei project's outputs and exploitation figures.

Blending an impact evaluation (impact chapter #1) approach with a strategizing approach (impact chapters #2 and #3) has the advantage of focusing the project on where we can realistically, and within the timeline of the project, assess impact, as well as to guide legacy activities after the project ends.

To summarise what has been learned and to respond to the central research question presented above, we see that Mingei has supported processes of digital transformation - both in terms of mindset and skills development - in the heritage partners. Despite the identified barriers to digital transformation, outcomes like positive attitudinal change, more confidence and a recognition of potential reputational impact, as well as indications of further project collaboration and innovation, are likely to lead to more sustainable future heritage crafts contexts. The pandemic, not unsurprisingly, reinforced the need and value of connecting regularly and authentically with wider heritage crafts communities. Drawing on the TBI and co-creation methodologies that were introduced to heritage partners as a result of Mingei, we can argue that having these tools in the organisations' and each professional's 'toolbox' is likely to lead to better outcomes in future in terms of heritage craft communities. We are certain that, having participated in Mingei, both technical and heritage partners alike have experienced positive outcomes relating to how they work together and with wider heritage crafts communities.

We can conclude by arguing that the potential legacy of the project is strong and that future heritage crafts organisations and communities, as well as wider CCIs, heritage institutions, policy-makers, tourism agencies and local governments, technical partners, and educationalists including museum mediators, are among the many stakeholders who may benefit from the approach taken by Mingei.

Future approaches to impact evaluation for digital heritage projects might benefit from or add to a recent theory about the value of museums and (tangible and intangible) cultural heritage experiences. In his latest book, "The value of museums", John H. Falk (2022) underlines that museums and CHIs are vehicles for accomplishing our own (identity) self-related needs and priorities. He also reveals as the main value of museums and heritage is the notion of well-being, by providing examples of personal, intellectual, social and physical well-being that may result from our involvement with heritage. He offers insights on how to apply the well-being theory to the problem of convincing funders and policy makers of the importance of these experiences and the value they deliver to the broader community.

If this theory is to be endorsed, new approaches and tools for proving and measuring impact shall follow, capable of identifying, then assessing, the various forms of well-being our engagement (of the broader public) with heritage may provoke (Falk, 2022). This perspective we take in this report is, as described, purposefully limited to assessing the impact of cultural heritage on heritage audiences and technical partners to meet a gap in impact perspective. The perspective of how the wider public engages with and benefits from the pilots is covered in WP6.

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Appendix I - GLO framework

Introduction

This Appendix sets out the adapted Generic Learning Outcomes (GLO) framework used in the Mingei project. It sets out the five categories of GLOs, skills, knowledge and understanding, enjoyment, inspiration and creativity; attitudes and values; activity, behaviour and progression. The tables below each cover one category and set out in the first column the outcomes relevant to Mingei. Those outcomes not relevant to Mingei are in italics.

Outcomes	Relevant to Mingei context?	High-level indicator	Validated indicator(s) Personal Impact	Validated indicator(s) Organisational Impact
Knowing how to do something	✓	- New (or improved) skills identified	- I feel i have gained more experience working in an international project with people from different backgrounds and professional skills - It has obliged me to review and read about Digital heritage and issues on digitization in general	
Being able to do new things	✓	- Sense of increased empowerment	- Desire to be involved in future projects; involved with other actors in the field (Europeana)	
Information management skills	✓	- New (or improved) skills identified	- Learning that it should be possible to provide mechanisms that secure both the (long-term) sustainability as well as the reuse of the digital materials	
Communication skills	✓	- New (or improved) skills relating to partnership working or communication identified - Reported better communications with public/audiences - Reported better communications/relationships with volunteers	- I would discuss more with the technical partners and try to have a better idea of their expectations as we did not seem to share these until some time in the project (my feeling anyway !) to avoid misunderstandings - It has changed my way of working with technical partners to develop digital applications.	- The need of volunteers who are at home in the digital world has become very apparent, also of training for the present volunteers to encourage them to embrace the new technology
<i>Intellectual skills</i>	<i>X</i>			
<i>Social skills</i>	<i>X</i>			
<i>Physical skills</i>	<i>X</i>			

Table 5. Table demonstrating the relevant outcomes and associated indicators found in the survey data collected from heritage partners relating to skills gained in Mingei.

2. Knowledge & Understanding

A better understanding of digital collaborations, requirements of partnerships with digital providers

Outcomes	Relevant to Mingei context?	High-level indicator	Validated indicator(s) Personal Impact	Validated indicator(s) Organisational Impact
Knowing what or about something	✓	- Increased understanding of requirements of digital collaborations	-through Mingei, I was introduced to impact assessment -it was a new procedure to use archival and fieldwork material to create personalities of human avatar workers and craftspersons	
Learning facts or information	✓	- Increased or new knowledge about digital collaborations	- about the objectives and the users' review as I think I was too confident about the technology's input, it needs quite a lot of mediation still - There are innovations possible through collaboration, e.g. the need to capture two people's movements simultaneously (CNAM glass-blowing example)	
Deepening understanding	✓	- Increased or new knowledge about digital collaborations	- Local coordinators help to streamline communication with crafts communities	- Mingei definitely raised interest in digitalisation and the desire to learn more
How arts and cultural organisations operate	✓	- Increased or new knowledge about requirements of collaborating with digital providers		- The need of volunteers who are at home in the digital world has become very apparent, also of training for the present volunteers to encourage them to embrace the new technology - the digitisation of artefacts contributes to impact as well as because the tangible outcomes help the institution to become more known by word of mouth - [co-creation] gives an insight into different aspects and different ways of thinking and evaluating the work at the museum.
Making sense of something	X			
Making links and relationships between things	X			

Table 6. Table demonstrating the relevant outcomes and associated indicators found in the survey data collected from heritage partners relating to knowledge and understanding gained in Mingei.

3. Enjoyment, Inspiration, Creativity

Enjoyment in the project, inspiration to do something new.

Outcomes	Relevant to Mingei context?	High-level indicator	Validated indicator(s) Personal Impact	Validated indicator(s) Organisational Impact
Having fun	✓	- Sense of enjoying the collaboration or project in general	- working with a group of very different people was a nice experience and a skill I've practised before - Communicating and working with people from different scientific backgrounds	
Innovative thoughts	✓	- Future actions identified (inspired to do something very new or previously uncomfortable to the respondent)	-I was astonished by the recording and analysis of human motion, an element that has triggered my research interest in conjunction with socio-cultural anthropology	
Creativity	✓	- Future actions identified (inspired to do something)	- co-creation offered playful methods during the brainstorming for the development of the digital applications (new methods) - [co-creation] encouraged new approaches to problems.	
Exploration, experimentation and making	✓	- Future actions identified (inspired to do something very new or previously uncomfortable to the respondent)	-it was enlightening to work closely with CNR for the ontological development of the mastic cultivation craft, where I saw my primary research translate into another discipline	- Crafts education organisations are likely to be interested in finding out about the potential of 3D digitisation (e.g. its potential for promotion to wide audiences)
Being inspired	✓	- Future actions identified (inspired to do something)	- I found the idea of TBI cycle interesting and will try to work on it for future project - I have grown a keen interest in continuing working with impact assessment in my future professional plans.	

Table 7. Table demonstrating the relevant outcomes and associated indicators found in the survey data collected from heritage partners relating to enjoyment, inspiration and creativity experienced in Mingei.

4. Attitudes and values

Attitudes to self-reported digital maturity

Outcomes	Relevant to Mingei context?	High-level indicator	Validated indicator(s) Personal Impact	Validated indicator(s) Organisational Impact
Opinions about ourselves (e.g. self-esteem)	✓	- Change in perception about the level of digital maturity	- impact can be created through knowledge sharing (TBI cycles) - I would prioritise more my expertise - It is more difficult to create meaningful collaboration by digital means	
Opinions or attitudes towards other people	✓	- Change in how they work with technical/digital professionals (shift from a client to a partner role)	- Taking an outside look at [museum professionals] point of view has helped me think more about their work conditions. - It has changed my way of working with technical partners to develop digital applications. I have gained experience in my organization's and their needs	- HC communities should ideally be involved formally in project planning, avoiding the risk of them feeling involved as an afterthought - HC communities give an alternative perspective ('pragmatic, practical) in contrast to the 'academic' approach of museums - There is a need to mitigate and respond to fears about digitisation replacing crafts practices and people - There may be no or few active relationships with crafts education institutions
Increased motivation	✓	- Willingness/interest to take part in further digital projects	- it probably gave a more open mind, and stressed the necessity of transmission	
Positive and negative attitudes about an experience	✓	- Feeling of having been fully involved in the project at all times - Idea of further potential to be involved more in future projects (haven't made the most of this opportunity)	- may be less sceptical in the future as far as digital projects are concerned. - [we should in the beginning] consider what benefits a project might bring and how best [the museum] could use these.	
Feelings	X			
Perceptions	X			

Outcomes	Relevant to Mingei context?	High-level indicator	Validated indicator(s) Personal Impact	Validated indicator(s) Organisational Impact
<i>Increased capacity for tolerance</i>	X			
<i>Empathy</i>	X			
<i>Attitudes towards an organisation</i>	X			
<i>Being surprised</i>	X			

Table 8. Table demonstrating the relevant outcomes and associated indicators found in the survey data collected from heritage partners relating to attitudes and values gained in Mingei.

5. Activity, behaviour and progression

Reflection on past activities, identify any changes, identify where possible the influences to cause the change, identify future intended or planned actions

Outcomes	Relevant to Mingei context?	High-level indicator	Validated indicator(s) Personal Impact	Validated indicator(s) Organisational Impact
What people do	✓	- Actions or behaviours identified as inspired, influenced or caused by the project - Ongoing digitisation or digital projects (separate to Mingei)	- Relationships are being nurtured and capitalised on for other activities	
What people intend to do	✓	- Likelihood to take part in future digital project collaborations - Planned future actions - Planned or ongoing digitisation or digital projects (separate to Mingei)	- It is a boost in the museum's confidence to be able to join European projects. I would like to engage with other projects.	
What people have done	✓	- Actions or behaviours identified as inspired, influenced or caused by the project - Completed or ongoing digitisation or digital projects (separate to Mingei)	- knowledge sharing (i.e. TBI cycle findings) to stimulate wider good practices in the sector - Have actively connected in the work of other digital heritage organisations (Europeana)	
Reported or observed actions	✓	- Identified changes amongst their colleagues	- Collaboration continuing through the Mingei network	
<i>A change in the way people manage their lives</i>	X			

Table 9. Table demonstrating the relevant outcomes and associated indicators found in the survey data collected from heritage partners relating to activity, behaviour and progression as a result of participation in Mingei.

Appendix II - Overview of the DigiTraining 'digital transformation syllabus'

The DigiTraining "Digital Transformation Syllabus"

- 3D digitisation and photographic documentation: Comprehensive, state of the art strategy and instructions for the digitisation of objects and sites.
 - Guide to the selection of digitisation modalities per type and size of the target, indoor/outdoor setting, material, and assessment of per (a) capability & affordability, (b) documentation purpose.
 - Emphasis on cost-efficient strategies and instructions to support capacity building by small CHIs.
 - Conformance to good practices and standards.
 - Focus on asset reuse, batch digitisation of catalogue content and archives to utilise material already existing in the archives of an organisation.
 - A comprehensive strategy and instructions for the digitisation of physical objects and environments, from city to object scale, in indoor and outdoor environments. This strategy guides the selection of digitisation modalities per type and size of the target, indoor/outdoor environment, material composition, and state, assessment of per (a) capability & affordability, and (b) documentation purpose. Emphasis is on cost-efficient strategies and instructions to support capacity building by small CHIs.
- Narrative content: Collection of data, information, and knowledge in digital form.
 - Organisation by thematically content with links to digitised content and curatorial rationale in presentational applications.
- Semantic Web technologies aid ontology population from existing and harvested content to:
 - Digitise and analyse multilingual textual sources and associate digital assets to legacy material (catalogues, guides, curatorial statements).
 - Compose basic knowledge elements annotating digital assets with quasi-structured catalogue information, i.e. events, locations, and dates, which are already available in the curated material.
 - Create meta-data for digital preservation. The participants will obtain the capacity to share their digital assets through Semantic Web aggregators, such as Europeana while retaining the IPR of their assets.

The DigiTraining “Digital Transformation Syllabus”

- Preservation: digitisation for the documentation and preservation of historical and cultural context of tangible treasures, for conservation against pollution, climate change, and conflict and human activity.
- Presentation: multimodal narrative presentations based on the semantic representation that references educational material in the knowledge base.
 - Presentation of content utilising appropriate presentation modalities, to cater to educational, interactive presentations, as co-designed by curatorial staff and digital transformation experts.
- Authoring narrative representations by linking digital assets and semantic representations of actors, locations, and events. Computer-aided representation of contextual information is provided through an authoring environment based on the Mingei Online Platform, which serves as a conceptual interface to the knowledge base. The representation is event-based and enables the representation of (a) knowledge elements: events, persons, objects, etc. (b) narratives that entertain a contextual topic in a chronologic form, and (c) schemas that are patterns followed by some classes of activities (i.e. a festivity or ceremony). To better contextualise the represented content, the proposed Digital Transformation will enhance the capacity of CHIs to represent their digital assets and narratives in time and space, according to the type of narrative and the location or region where it occurred,
 - Time is verbalised in scales of times, eras, and moments. Historians refer to events in terms of duration similarly: long-standing (*longue durée*), eras (dynasties, generations), and any person or party lifetime (*courte durée*). Temporal abstractions map event relationships as represented through Allen’s algebra. Time-variant representation enables comparative assessment of digitizations over time and in correlation with external factors such as technological progress or economic events.
 - Space is represented according to purpose. Maps are 2D representations for space-variant activities. In finer scales, 3D representation is important, to represent the geometry and appearance of sites and objects. The figure below on the right shows a map with historical annotations. In finer scales, 3D representation is important, to represent the geometry and appearance of sites and objects.

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