IMPULSE

IMmersive digitisation: uPcycling cULtural heritage towards new reviving StratEgies

Deliverable D1.5
Ideation and co-creation workshops

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1 Document Information

Document Identification			
Status	Final	Due Date	7 October 2025
Version	3.1	Submission Date	7 October 2025
Related WP	WP1	Document Reference	D1.5
Related Task(s)	1.2., 1.2, 1.3	Document Type	DEM
Related Deliverable(s)	D1.9	Dissemination Level	PU
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Document History			
Version	Date	Modified by	Modification reason
1.0	19.09.2025	Authors	First draft

1.0	26.9.2025	Reviewers	Internal review
2.0	27.09.2025	Authors	Internal reviewer's comments implementation
2.0	28.09.2025	Reviewers	Second internal review
2.0	29.09.2025	Reviewers	Evaluation by the QC Team
3.0	03.10.2025	Authors	Evaluation team's comments implementation
3.1	05-07.10.2025	Łukasz Pieczonka (JU) Karolina Wawok (JU) Żaneta Żegleń (JU)	Second evaluation by the QA Team and assigned experts

Quality Control		
Role	Who (Partner short name)	Approval Date
Deliverable leader	Adnan Hadziselimovic (UM)	30.10.2025
Quality manager	Łukasz Pieczonak (JU)	05.10.2025
Project Coordinator	Żaneta Żegleń (JU)	07.10.2025

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3 Abbreviations and Acronyms

Abbreviation / acronym	Description
CH	Cultural Heritage
VE	Virtual Environment
VR	Virtual Reality
AR	Augmented Reality
OSS	Open Source Software
MoCap	Motion Capture

4 Executive Summary

This report presents the outcomes of a series of ideation and co-creation workshops conducted under Task 1.2 and Task 1.3 of the IMPULSE project, structured into three interconnected streams: Interactive Art, Performing Heritage, and Teaching & Learning. Together, these streams explore how digital heritage can be reimagined through artistic research, speculative methods, and collaborative pedagogies, with particular emphasis on non-anthropocentric perspectives, critical approaches to technology, and participatory models of cultural engagement.

Number of workshops	**18**
Total number of unique participants	**77**
N. of unique participants Teaching & Learning Stream	**49** (3x curator, 33x researcher, 7x artist, 6x student)
N. of unique participants Interactive Art Stream	**15** (12x researcher, 3x artist)
N. of unique participants performing heritage stream	**13** (5x researcher, 4x artist, 4x student)

Status against KPI (DoA)

KPI	**(DoA)**	**Status**
N. of ideation and co-creation workshops with artists using speculative methods	**6**	**18**
N. of people benefiting from co-creation workshops	**60**	**77**

The Interactive Art (Oh and Shi 2021) stream, led by the NKUA team, investigated how artists can employ cultural heritage assets to develop immersive, interactive audiovisual experiences. Rooted in a critique of anthropocentric thinking, the project repositioned the human as one actor within a broader ecology of natural and cultural entities. Online ideation sessions and offline co-creation workshops guided artists in reframing assets, from minerals and caves to historical artifacts, through speculative design principles. A shared curatorial board enabled collaborative asset selection, annotation, and categorization, revealing thematic clusters and cross-category relationships. Technical experimentation focused on integrating heterogeneous media formats into a multi-user virtual environment, using 3D models, images, audio, and video to shape dynamic interactions. Co-creation sessions, supported by the IMPULSE VR platform, allowed for collaborative spatial composition and emergent narratives, with particular attention to translating non-human temporalities, scales, and perspectives into user

experience. Speculative interaction models, such as masks as portals or exaggerated object scaling, encouraged audiences to navigate perception as much as virtual space.

The Performing Heritage stream extended this inquiry into live, speculative performance-making. Framed by posthuman, feminist (Hester 2018), and decolonial theories, the workshops positioned heritage not as a static archive but as a living, dynamic practice open to reinvention. Artists critically engaged with technologies and embraced glitches and process transparency, aligning aesthetics with ethical commitments to accessibility and openness. Anchored in Maltese heritage sites, including Ġgantija, Mnajdra, and Ħal Saflieni, the work treated architecture, resonance, and myth as active collaborators. Hybrid online–offline workshops incorporated MOCAP, VR/AR devices for real-time performance. Outcomes include a conceptual framework for performing heritage and prototype (Arrigoni 2016) proposals for future performances, notably an augmented reality event at Ġgantija in 2026 that merges motion-tracked choreography, speculative avatars, and responsive soundscapes.

The Teaching & Learning stream focused on developing reciprocal, co-creative models of education in digital heritage. Spanning December 2024 to September 2025, workshops engaged curators, students, archivists, artists, and technologists in jointly interpreting digitized collections and prototyping experiences for a multi-user virtual platform. Activities moved from institutional grounding with Heritage Malta to hackathon-style ideation in Leuven, through gaming-informed co-design sessions and continuous online collaboration. Two thematic anchors, Navigation and Bodies, were prioritized, linking maritime histories, embodiment, and visual culture to pedagogical goals. Prototyping emphasized collaborative features, provenance visibility, and user-centered design, while feedback highlighted accessibility, affective engagement, and the need to address colonial legacies with transparency. The stream culminates in the orientation exhibition as playground, a metaphor that legitimizes exploration, storytelling, and co-creation as integral to learning while preserving curatorial rigor.

Across all three streams, the workshops demonstrated that non-anthropocentric perspectives, speculative fabulation, and participatory methodologies can generate new narratives, technical pathways, and pedagogical strategies for engaging with cultural heritage. The ideation & co-creation workshops produced conceptual frameworks and experimental pilots that inform both future IMPULSE activities and broader applications of digital heritage practice.

The ideation and co-creation workshops across the three IMPULSE streams — Interactive Art, Performing Heritage, and Teaching & Learning — collectively demonstrated that

immersive, participatory, and speculative approaches can transform how cultural heritage is understood and experienced. The main findings confirm that non-anthropocentric perspectives, open-source ethics, and collaborative authorship offer powerful frameworks for reimagining heritage as a living, dynamic field rather than a static archive (Spieker 2017). Artists and educators alike showed that co-creation generates richer, more inclusive interpretations of cultural assets when grounded in transparency, provenance, and creative experimentation. Across all streams, the project validated its interdisciplinary model: combining artistic research, critical digitality, and pedagogical innovation to create meaningful, accessible experiences of digital heritage.

Links to Other Work Packages and Prototypes

The outcomes of the ideation and co-creation workshops directly inform the next phase of the IMPULSE project and establish clear continuities with Work Packages 2, 3, and 4, as outlined in the Description of Action (DoA). The workshops not only produced conceptual and methodological insights but also generated practical frameworks that will guide the design and testing of prototypes during the forthcoming prototyping season. These connections were reinforced through a series of Deep Dive sessions held during the co-creation phase, which explicitly bridged artistic experimentation with technical development, digitisation workflows, and legal-ethical frameworks.

The Deep Dive on WP2, “Volumetric Contemporary Testimony of Holocaust Survivors” (FBWK), provided a key reference for understanding narrative embodiment and volumetric representation, linking directly with the Interactive Art and Performing Heritage streams’ experiments (Baker and Sicchio 2016) in spatial storytelling and human–non-human relationality. Complementing this, “A methodology for the design and production of virtual environments with a focus on the creative aspects” (NKUA), offered foundational principles for the co-creation of immersive spaces, feeding into both WP2 development and the IMPULSE platform’s artistic research prototypes. “AI Tricks for Metaverse Content Creation” (FBWK), explored generative and adaptive tools for 3D asset creation and scene composition, now informing the technical pipelines of the upcoming prototypes.

Links to WP3 were strengthened through the Deep Dive on the digitisation of cultural heritage, which connected the workshop’s curatorial and pedagogical insights to ongoing digitisation and metadata enhancement processes. This ensures that cultural assets integrated into the prototypes are interoperable and provenance-aware. In parallel, the Deep Dive on WP4, “Determining the legal status of objects and their digital

representations" (JU), clarified how copyright, licensing, and ownership considerations shape creative reuse and co-creation within virtual environments, directly informing ethical and legal compliance for the forthcoming demonstrators.

Together, these Deep Dive sessions act as conceptual and procedural bridges between the exploratory work of WP1 and the implementation-oriented tasks of WPs 2–4. The prototyping season, scheduled for the next academic year, will translate these cross-WP insights into functional, demonstrable outputs — ensuring that each prototype is informed by the project's broader research architecture, aligned with IMPULSE's interdisciplinary goals, and ready for evaluation within the integrated framework of artistic, technical, and legal innovation.

Building on these results, the next phase will consolidate outcomes into the prototyping season, where three dedicated teams will advance the development of the IMPULSE prototypes. Each stream will translate workshop insights into tangible outputs: the Interactive Art team will refine multi-user VR environments and interaction models; the Performing Heritage team will prepare the augmented reality performance at Ġgantija; and the Teaching & Learning team will implement the "exhibition as playground" model for collaborative learning. These prototypes, informed by the deep dive co-creation sessions, will test the project's conceptual and technical frameworks in real use contexts. Together, they mark a transition from ideation to demonstration, positioning IMPULSE to deliver innovative, inclusive, and sustainable models for engaging with Europe's digital cultural heritage.

The report that follows provides a structured synthesis of this work: a set of keywords to stabilize vocabulary, a glossary of abbreviations and acronyms as used in the stream, explicit objectives for the offline and co-creation workshops, a detailed articulation of scope and focus areas drawing on the documented sessions, a delineation of target audiences, and a narrative of settings, engagement, and activities. The deliverable is designed to be actionable by partners preparing the September co-design sessions and to be transferable to other contexts seeking to teach and learn with digital heritage through co-creation.

Key words:

Interactive Art, Co-creation, Cultural Heritage (CH), Speculative Methods, Virtual Environments (Ves), Non-Anthropocentric Perspectives, Artistic Research, Ideation and Conceptualization, Digital Heritage, Teaching and learning in digital heritage, Exhibition as playground, Navigation, Accessibility, Performing heritage, Speculative fabulation, Livecoding, Posthuman feminism, Storytelling

5 Ideation & co-creation workshops Overview

Ideation & co-creation workshop methods

The methodological framework of the IMPULSE ideation and co-creation workshops was designed to merge artistic research, participatory co-design, and digital heritage practice. Rather than serving as isolated consultations, the workshops acted as laboratories for iterative experimentation and reflection. Three interconnected streams, Interactive Art, Performing Heritage, and Teaching and Learning, were structured to test how collaborative and speculative approaches could reframe the interpretation and experience of cultural heritage in digital contexts. Across the streams, several shared methodological principles provided coherence. First, the workshops adopted a non-anthropocentric perspective, repositioning humans as one element in a larger ecology of cultural and natural actors. This orientation influenced asset selection, narrative strategies, and the staging of performances. Second, all workshops prioritised participatory co-creation, inviting artists, curators, students, and technologists to work together as co-authors rather than recipients of pre-designed experiences. Third, speculative fabulation was used as a methodological lens to reimagine heritage beyond its conventional narratives, opening space for alternative stories, hybrid identities, and imaginative futures. Fourth, transparency and open-source ethics guided the technical approach, ensuring that processes remained visible and accessible, while open source software aligned aesthetics with ethical commitments. Fifth, the workshops relied on practice-based experimentation, using small-scale piloting to identify viable approaches before scaling. Finally, documentation was treated as an active research practice, with notes, audiovisual recordings, and technical logs functioning as both evidence and creative material.

The Interactive Art (Bressan et al. 2017) stream progressed through ideation, curation, piloting, and co-creation. Online sessions generated conceptual maps and micro-narratives around cultural assets, while a shared curatorial board enabled transparent selection and categorization. Technical experiments explored the integration of heterogeneous media, 2D images, 3D models, audio, and video, into immersive environments. Co-creation unfolded in a hybrid mode, with collaborative composition in the IMPULSE multi-user VR platform complemented by offline prototyping in Blender and Unity. This stream demonstrated how collaborative authorship and speculative scaling could reshape user experiences of cultural heritage. The Performing Heritage stream combined critical theory, artistic research, and open technical workflows. Its methodology drew on posthuman, feminist (Plant 1997), and decolonial perspectives,

treating heritage as a living and dynamic field. Workshops alternated between online story exchanges and offline rehearsals using motion capture, VR/AR headsets, and livecoding. A distinctive feature was the use of glitches and seams as aesthetic devices, making visible the technical processes underlying performance. Site-specific dramaturgy played a central role, with the Maltese temples of Ġgantija, Mnajdra, and Ħal Saflieni engaged as co-performers. Through speculative narratives, soundscapes, and XR dramaturgies, the stream explored how heritage can be enacted as an imaginative, relational practice.

The Teaching and Learning stream emphasized reciprocal pedagogy and collaborative piloting. It began with institutional grounding at Heritage Malta, addressing issues of rights and authenticity. Hackathon-style ideation sessions in Leuven and subsequent workshops integrated gaming-informed structures, while two thematic anchors, navigation and bodies, provided continuity across activities. Online sessions maintained continuity and allowed participants to test assets and design metaphors in a multi-user virtual platform. The stream's culminating metaphor, "exhibition as playground," encapsulated its methodological aim to legitimize exploration, storytelling, and co-creation while retaining curatorial rigor. Across all three streams, documentation and evaluation were continuous and participatory, ensuring that the methodology remained responsive and adaptive. The methods developed are transferable, particularly in their use of shared curatorial tools, open-source workflows, and participatory co-design models. Limitations included technical constraints, accessibility barriers, and the challenge of balancing speculative creativity with curatorial accuracy. Nevertheless, the workshops demonstrated how collaborative, speculative, and critical approaches can generate new pathways for engaging with cultural heritage in digital environments.

The ideation and co-creation process within IMPULSE was designed and implemented following the Double Diamond model, which structures innovation into four iterative and interconnected phases: Discovery, Explore–Defining, Develop and Test, and Deliver–Listen. This model provided the overarching methodological architecture guiding the workshops, ensuring a consistent transdisciplinary approach that integrated artistic exploration, technological development, pedagogical innovation, and legal-ethical reflection. During the Discovery phase, teams mapped the context, needs, and requirements of the project through diagnostic studies and user observation. In alignment with the IMPULSE framework, this phase synthesised findings from WP1 (artistic and participatory research), WP2 (technical solutions for immersive environments), WP3 (digitisation standards and interoperability), and WP4 (legal frameworks and cultural data governance). Tools such as online ethnographic mapping,

collaborative whiteboards (Miro, Padlet), and shared digital repositories were used to visualise relationships between cultural assets, audiences, and interpretive practices.

The Explore–Defining phase operationalised co-design and speculative ideation. Workshop teams employed shared browser-based interfaces and a pilot multi-user virtual environment to interact with digitised heritage collections and test conceptual ideas in real time. Across the workshop sessions, participants collaboratively defined artistic and curatorial directions through iterative experimentation, enabling synchronous and asynchronous contributions across institutions and disciplines.

In the Develop and Test phase, the model guided the transition from ideation to prototyping. Artists, educators, and technologists developed and tested multiple design solutions, advancing from conceptual sketches to functional demonstrators. This iterative process emphasised user feedback, and continuous testing within the virtual environments. The workflows combined creative iteration (storyboarding, asset generation, and dramaturgical scripting) with technical iteration (multi-user testing, interaction logic, and user interface refinement). Documentation was embedded in the process, using screen capture, ethnographic notes, and collaborative logs, aligning with IMPULSE's open research and reproducibility principles.

Finally, the Deliver–Listen phase—initiated through feedback and evaluation loops within the workshops—prepared the foundation for the prototyping season scheduled for the next academic year. The workflow incorporated regular reflection sessions, evaluation forms, and technical reviews to assess usability, artistic integrity, and inclusivity. Feedback mechanisms will be further formalised in upcoming user experience (UX) studies within WP1 and WP2, ensuring that insights from this phase inform the refinement and scaling of the prototypes.

Across all stages, the Double Diamond model functioned as both a process framework and communication tool, aligning diverse partners around a shared structure for creativity, reflection, and validation. It facilitated iterative cycles of divergence and convergence—first expanding the field of possible ideas, then refining them into actionable prototype directions. This structured yet flexible approach ensured coherence across the three streams—Interactive Art, Performing Heritage, and Teaching & Learning—while maintaining interoperability with the parallel research objectives of WPs 2–4.

Date	**Workshop**	**#participants**
11/10/2024	Ideation Workshop	~15-20
25/10/2024	Ideation Workshop	~15-20
08/11/2024	Ideation Workshop	~15-20

22/11/2024	Ideation Workshop	~15-20
06/12/2024	Ideation Workshop	~15-20
20/12/2024	Ideation Workshop	~15-20
03/01/2025	Ideation Workshop	~10-15
17/01/2025	Ideation Workshop	~10-15
18-19/02/2025	Ideation & Piloting Workshop	32
21/03/2025	Deep Dive & Piloting Co-Creation Workshop	~20-25
28/03/2025	Deep Dive & Piloting Co-Creation Workshop	~20-25
25/04/2025	Deep Dive & Piloting Co-Creation Workshop	~20-25
13-16/05/2025	Piloting Co-Creation Workshop	4
23/05/2025	Deep Dive & Piloting Co-Creation Workshop	~20-25
20/06/2025	Deep Dive & Piloting Co-Creation Workshop	~20-25
01-04/07/2025	Piloting Co-Creation Workshop	4
18/07/2025	Deep Dive & Piloting Co-Creation Workshop	~20-25
16-18/9/2025	Prototyping Co-Creation Workshop	33

Participant recruitment for the IMPULSE ideation and co-creation workshops was guided by the project's transdisciplinary framework, prioritising diversity across artistic, cultural, and educational backgrounds. Participants were selected through open calls, targeted invitations, and institutional partnerships to ensure representation from the three core streams — Interactive Art, Performing Heritage, and Teaching & Learning. Selection criteria included demonstrated experience in digital or performative arts, curatorial or educational practice, interest in digital heritage and immersive media, and commitment to collaborative, experimental work. Additional attention was given to geographic balance within the consortium countries and to the inclusion of underrepresented groups in cultural and creative sectors. Each workshop cohort was designed to foster a mix of expertise, including artists, educators, technologists, curators, and researchers, to reflect the project's multi-perspective co-creation ethos.

All participant engagement and data handling adhered to the ethical, legal, and data management standards outlined in the IMPULSE Data Management Plan (Deliverable D6.2). In accordance with the General Data Protection Regulation (GDPR) and the ethical principles of Horizon Europe, informed consent was obtained from every participant prior to data collection. Consent procedures were documented using the IMPULSE consortium's standard forms, which detailed the purpose, duration, and scope of participation, the types of data collected (including audiovisual recordings, written notes, and digital artefacts), and the participants' rights to withdraw or modify consent

at any stage. Data processing followed the procedures described in Annex 1 – Data Processing Activities of the DMP, ensuring that personal data was minimised, pseudonymised where possible, and stored securely.

Data security measures, as defined in the DMP, included encrypted storage, restricted access, and secure transfer protocols (HTTPS, SFTP, VPN) for all files containing personal or sensitive data. Regular backups and controlled access systems were implemented to maintain data integrity, and access was limited to authorised project members directly involved in the analysis. No biometric or sensitive personal data were processed beyond what was necessary for research and documentation purposes. The management of digital recordings followed FAIR principles (Findable, Accessible, Interoperable, Reusable) under the guideline "as open as possible, as closed as necessary," ensuring ethical reuse of materials while maintaining compliance with participants' consent terms.

Finally, all procedures were initially overseen by the data stewards designated within WP6 and reviewed by the Jagiellonian University ethics and data protection officer, in alignment with the Horizon Europe requirements for responsible research. By integrating transparent recruitment and rigorous GDPR-aligned consent processes, the IMPULSE project ensured that its collaborative artistic and educational research activities were conducted ethically, securely, and inclusively—providing a strong methodological foundation for subsequent prototype development and evaluation phases.

Overview Interactive Art stream

The interactive art stream undertaken within Task 1.2: Artistic Research Prototype in the direction of Interactive Audiovisual Arts. Led by the NKUA team, the stream investigates how digital media artists work with cultural heritage assets to create interactive audiovisual experiences and how iterative, practice-based methods can surface new narratives, insights, and interpretations of heritage across virtual environments. The report consolidates the methods, design, execution, and outcomes of online ideation and offline co-creation workshops, the development of an initial concept for a multi-user virtual environment, the curatorial and technical pathways that enabled the incorporation of heterogeneous cultural assets, and the speculative methods that shaped the conceptual and aesthetic approach. It also articulates user experience considerations, interaction affordances, and challenges encountered when integrating diverse formats—three-dimensional models, two-dimensional images, audio recordings, and video—within the constraints and possibilities of virtual environments.

The interactive art stream begins by framing the need for artistic research that both interrogates and expands how cultural heritage is understood. The NKUA team positioned the interactive artwork within a critical perspective on the Anthropocene and the limits of anthropocentric thinking, contending that human-centered hierarchies have constrained how cultural assets are narrated and perceived. In response, the workshops-oriented artists toward non-anthropocentric perspectives: the human is repositioned as one node in a web of interdependencies with non-human and more-than-human entities, from minerals and caves to animals and atmospheric phenomena. This conceptual orientation was not treated as an abstract theme but as a practical design principle that inflected asset selection, compositional strategies, interaction models, and the tempo and scale at which audiences encounter cultural content in virtual space.

The ideation and conceptualization phase unfolded through a series of collaborative online sessions in which participants exchanged perspectives, jointly developed concepts, and mapped micro-narratives around selected cultural assets. Dialogues with curators and archive holders were central to this process. These exchanges offered specific knowledge of provenance, historical context, and usage constraints; they also enabled artists to identify interpretive gaps that could be addressed through speculative reframing. Through structured brainstorming and conceptual mapping, the team converged on an initial concept for a multi-user virtual environment that foregrounds non-anthropocentric temporalities and scales, emphasizes human–nature interconnectedness, and challenges dominant narratives inscribed in cultural heritage.

From this conceptual foundation, the team developed selection criteria and curatorial workflows for cultural assets. The criteria privileged assets that were thematically aligned with the concept and offered meaningful potential for re-contextualization in a virtual environment. To structure collaboration, a shared online board was introduced to group assets, provide thumbnails and direct links to source collections, and record curatorial annotations. This board functioned as a cognitive map where categories such as Natural Elements Minerals, Human Body, CH objects from Africa and Masks, Contemporary daily life, Posters, and Artworks could be arranged, related, and iteratively refined. The categorization process facilitated recognition of patterns and thematic clusters; it also helped the team discover cross-category relationships that later informed interaction design and spatial composition.

Parallel to curatorial work, the team prototyped interaction affordances and spatial logics for the virtual environment, addressing the specific technical challenges of integrating heterogeneous formats. Early tests revealed that 2D images can operate effectively

as textures on planes and volumes, as UI layers for narrative prompts, or as seeds for AI-assisted three-dimensional reconstruction; that audio can be used as voice, soundscape, narrative anchor, and data source for interactive parameters; that 3D models often require conversion, re-anchoring, decimation, and retopology to meet performance targets; and that video can function as environmental lighting references, surface projections, or documentary strata embedded in the world. These observations guided a practice-based bottom-up methodology in which small, focused experiments yielded insight into what kinds of combinations, scales, and timings best support the overall concept and aesthetics.

Co-creation sessions then moved into a hybrid online–offline mode. Online, the team employed the IMPULSE multi-user virtual reality platform to experiment with collaborative composition, co-presence, and shared manipulation of imported cultural assets. Offline, artists worked with Blender for modelling and assemblage, and with game engines such as Unity 3D to test shaders, lighting, and responsive behaviors. The multi-user platform was pivotal for testing how different users concurrently encounter, re-arrange, and interpret cultural content, and how collaborative spatial composition can yield emergent narratives that are difficult to achieve through single-author workflows. The platform's web client supported asset browsing, rapid selection, and iterative curation with the benefit of metadata visibility and traceable provenance.

A consistent concern during all stages was the translation of the non-anthropocentric orientation into decisions that affect the audience's experience. In practice, this meant designing with non-human conceptions of time and scale, allowing geological processes and mineral forms to set the rhythm of narrative transitions; using interaction that is not always human-centered but sometimes triggered by environmental states or cross-asset relations; and reframing certain cultural artifacts—especially those historically linked to power and hierarchy—so that they acquire new meanings in juxtaposition with natural elements or in response to altered sound and spatial composition. The team also explored speculative interaction techniques such as using masks as portals or gates that transform perspective, or re-scaling objects beyond plausible human proportions to encourage visitors to navigate perception rather than merely space.

Overview Performing Heritage stream

A comprehensive account of the performing heritage stream undertaken within Task 1.2 of the IMPULSE project, with a focus on the design, execution, and results of online and offline ideation and co-creation workshops with artists using speculative methods. The stream examined how performing heritage can be critically and imaginatively

reinterpreted when framed by non-anthropocentric perspectives and when developed through an artistic research (Simoniti 2023) methodology that privileges transparency, libre open-source technologies, livecoding practices, and a deliberate aesthetic of glitches, fractures, and process. The work positions performing heritage as a living, dynamic field, not limited to the reproduction of established traditions but open to speculative fabulation and novel narrative construction that entangles past, present, and possible futures. In this approach, heritage is not merely curated or displayed but enacted, interrogated, and transformed.

At the conceptual core of this stream is a critique of anthropocentrism and human exceptionalism that has historically organized hierarchies between humans and non-humans. The project recognizes that such hierarchies have fueled power relations that extend from human exploitation of nature to forms of domination among humans themselves. The workshops take up a non-anthropocentric perspective as both a philosophical and epistemological orientation and a practical guide for performance-making. This perspective invites participants to situate human performers as nodes within wider interdependent networks of more-than-human entities and to experiment with scales and temporalities that exceed human lifeworlds, including geological time and ecological rhythms. The idea is not to erase human but to decenter it, to bring attention to the mesh of relations in which performance, heritage, and technology are jointly entangled.

This orientation gains further depth from a critical theory of technology that refuses to consider tools and infrastructures as neutral or purely instrumental. Technologies are embedded in social, economic, and political contexts and necessarily carry ideological charge. The workshops explicitly expose these workings by foregrounding livecoding, by making process visible, by embracing errors and disruptions as meaningful, and by privileging libre open-source software and open hardware wherever feasible. The preference for open systems aligns the aesthetics and the ethics of the work. On the one hand, it enables artists to seize means of production, to understand and modify underlying code, and to make their practices more accessible and shareable. On the other hand, it shapes the visual and sonic language of the performances, which lean into opacity-breaking gestures, visible seams, wireframes, distortions, and fractures rather than into illusionistic smoothness. The glitch is not treated as a flaw to be hidden but as material to be composed with, a sign of friction that reveals how systems operate and where they fail.

The theoretical foundation is equally informed by intersectional posthuman trans-feminism (Bhattacharjee 2024) and decolonial thinking. These frameworks provide tools for queering cultural memory and dismantling binary categories, especially those that tie

gender to racialized constructions of power in Western modernity. They invite a practice of performing heritage that listens to suppressed histories and treats archives as sites of struggle rather than passive repositories. The workshops draw on these ideas to invent figures and narratives that resist patriarchal dominance and colonial legacies, and to build performances that do not speak for heritage but speak with it, cultivating a practice of making-with that Donna Haraway (Haraway 2016) describes as sym-poiesis. The speculative task is to fabulate worlds in which hybrids and in-between beings, including witches, giantesses, shamans, minerals, and code, co-compose performances that are as much about becoming as they are about remembering.

The geographic and cultural setting for the speculative narrative centers on the Maltese megalithic temples, with particular attention to Ġgantija and Mnajdra, and on the subterranean complex of Ħal Saflieni. These sites are not simply historical backdrops but active collaborators in the fabulation. Ġgantija offers a locus where myth and archaeology interweave, imagined here as a meeting ground for a shaman-witch-giantess and a present-day performer whose movements are captured in real time and transcoded into sound and avatar forms in augmented reality. Mnajdra is read as an astronomical technology, a structure whose alignments prompt stories about celestial timing, portals, thresholds, and the lifeworlds of stone. Ħal Saflieni is approached as an acoustic architecture whose resonances around 110 and 114 Hertz are treated as sonic gateways to other temporalities, a premise for designing performance cues and soundscapes that thicken time rather than merely mark it. The point of these engagements is to activate performing heritage through speculative means, to ask what these places become when they are approached not only as objects of study but as companions in making.

The workshops unfolded as a hybrid of online and offline practices. Offline, artists and researchers worked with MOCAP for recording and real-time tracking of movement. They tested CVR 360 recordings, as well as augmented and virtual reality headsets, including Hololens and PICO, while also considering pathways for wider accessibility via tablets and phones. Online, they shared documentation, wrote and exchanged stories, planned technical interoperability, and used remote collaboration for planning and design critique. Continuous documentation was not a peripheral task but a central pillar of the methodology: textual notebooks, video diaries, technical logs, and sound sketches were gathered to serve as both a research archive and a reservoir of performable media.

Technically, the stream took up the challenge of interoperability across open toolchains and extended reality devices. A typical pipeline was discussed which could link freeMOCAP's skeletal data to control signals that modulated SuperCollider instruments,

deformed meshes and particle systems in Godot, and dynamically altered the behavior of avatars and spatialized audio in XR contexts. Rather than adopting a closed platform for real-time performance, the team discussed modular tools and used livecoding to stitch them together, treating modularity as both a technical and conceptual strategy. In offline experiments, code was projected and discussed, aligning the process with the livecoding ethos of transparent making.

The principal outcomes can be grouped into three broad categories. First, a conceptual framework for performing heritage that integrates non-anthropocentric ethics, critical theory of technology, feminist (Russell 2020) and decolonial critique, and speculative fabulation into an actionable method for workshop design, rehearsal, prototyping, and performance. Second, a corpus of documentation, including text, video, audio, and rendered sequences, which both evidences the process and serves as media for performance. Third, a set of technical and performative proposed prototypes pointing to future outcomes: an augmented reality performance at Ġgantija in the second half of 2026 that couples motion-tracked choreography with a pan-gender (Heim et al. 2022) shaman-witch avatar and reactive soundscapes delivered through headphones or public address; an ongoing, carefully maintained documentation practice whose analysis is scheduled for the final phase of IMPULSE; and a culminating performance-presentation end 2026 that interleaves live extended reality fragments, documentation materials, and movement vocabularies developed on site.

Overview Teaching & Learning stream

Finally, the report documents the design, facilitation, and outcomes of the teaching and learning stream for digital heritage carried out through a coordinated sequence of offline and online ideation and co-creation workshops between December 2024 and September 2025. The stream's overarching purpose was to prototype reciprocal models of learning in which teachers, students, curators, archivists, artists, and technologists jointly interpret digitized cultural heritage, build contextual layers around objects, and co-create experiences for an emerging multi-user virtual platform. The work proceeds from the premise that meaningful learning in digital heritage is not a one-way transmission of facts but a negotiated practice that interweaves curatorial rigor, pedagogical design, and collaborative authorship. It specifically advances Task 1.3 of WP1 by connecting insights from the user survey in Task 1.1 and the ideation work of Task 1.2 to concrete teaching and learning prototypes, a transferable methodology, and a playbook for community interaction.

The stream is structured around a set of time-bound engagements. An extended in-person workshop with Heritage Malta staff on 19 December 2024 grounded the program in institutional realities, including ownership, rights, authenticity, and accuracy in representation, as well as the role of immersion in museum education and the challenges of visitor engagement onsite and online. Two pre-hackathon workshops in Leuven on 19 and 20 February 2025 shifted focus from institutional parameters to collaborative concept development and early experience framing. Two workshops on 26 and 28 July brought digital games experts, digital artists, students, and academics into the mix, interrogating how game-informed structures can scaffold inquiry without instrumentalizing heritage. A series of three workshops with heritage curators on 4 and 5 September 2025 is planned to consolidate co-design around curatorial workflows inside the platform. Running in parallel, monthly online ideation sessions from March 2025 and bi-weekly core-team meetings from May 2025 maintained continuity, enabled cross-partner exchange, and synchronized design with incremental platform development.

Across these engagements, the work progressed through a deliberate arc. The group began with partner collection deep-dives led by archivists and curators from KU Leuven, Magna Żmien Foundation, the Thessaloniki Film Festival, the Film University of Babelsberg, and Heritage Malta. These sessions expanded the team's understanding of digitization practices, metadata and rights, and ethical considerations. The focus then turned to pedagogy, comparing active and passive engagement, individual and collaborative learning online, and the respective strengths and limitations of classroom, gallery, and virtual settings. A set of educational areas was collectively prioritized—historical information, design teaching, curatorial methodologies, archival practice, and visual culture with critical thinking—so that the platform could be anchored to concrete learning outcomes. The team tested collaborative formats that ranged from narrative and storytelling practices through task-driven and game-informed worlds to free-flowing, time-based experiences that privilege affect, dwelling, and curiosity. The consensus was to sustain a portfolio of modes, leaning toward open exploration when the goal is to broaden interpretive agency and toward more structured tasks when the goal is to make visible specific curatorial or archival procedures (Eastwood 1994).

Two thematic concentrations, Navigation and Bodies, emerged as productive anchors because they align closely with partner assets and naturally braid together historical, technical, curatorial, and ethical threads. Navigation connects maritime and scientific instruments, routes, wayfinding, and the imaginaries of travel and trade; Bodies connect representation and embodiment across posters, film, amateur footage, and photographic archives while foregrounding questions about normativity, difference, and power. As the virtual platform matured, a subset of online sessions moved into

hands-on prototyping. Participants imported trial assets, tested navigation metaphors and manipulation tools, and critiqued the aesthetics and legibility of the shared space. Live feedback stressed provenance visibility without cognitive overload, clear transitions between browsing, examining, and co-creating, and robust collaborative features such as state indicators, light-touch version control, and undo.

A detailed feedback corpus from the February pre-hackathon and the July workshops was synthesized into thematic findings (Stadon and Grasset 2011). Access, accessibility, and agency were identified as core design drivers, with particular attention to older users and to balancing ease of entry with depth of information. Limits and boundaries were reframed as pedagogical tools rather than mere constraints; offering choices among open exploration and bounded tasks can tune experiences to different audiences. The affective dimension of experience—especially sound, spoken words, and atmosphere—was recognized as central to engagement, with several participants arguing that ambience can sometimes be more educationally effective than exhaustive accuracy. The fragile materiality of artifacts and the aesthetics of disintegration in digital space were flagged as powerful motifs for activity design. Power dynamics within collections, especially colonial dehumanization and problematic content in legacy materials, were treated as ethical imperatives; the group stressed the need to contextualize rather than erase while avoiding harm. Diversity, alternative histories, and humor were welcomed as means to widen participation and deepen learning. Community and co-creation were understood as both process and product, with collaborative narrative-building and shared making positioned as key to platform identity. Speculation and storytelling were affirmed as engines of curiosity, provided they remain accountable to provenance and clearly signposted as interpretive rather than evidentiary.

The stream culminates in a proposed teaching and learning orientation summarized as exhibition as playground. This metaphor legitimizes exploration, juxtaposition, and co-creation as central curatorial moves while preserving space for historical information to play a decisive role in building narratives. It leverages contemporary curatorial methodologies, including the curatorial as a connective practice, relational and experiential approaches, contact and conflict zones in museums, and decolonial perspectives that interrogate how collections were assembled and are still interpreted. Within this frame, the Maritime Museum collection serves as a primary vehicle for prototyping due to its accessibility for digitization, while a Magna Żmien dataset of still and moving images linked to prehistoric sites adds a contrasting lens on access, embodiment, and family record as heritage.

6 Objectives

Objectives ideation & co-creation Interactive Art

The workshops were designed to meet interdependent objectives that translate conceptual commitments into artistic and technical practice. The first objective was to cultivate, test, and refine a non-anthropocentric approach to interactive audiovisual art. This entails both a critical stance and a generative toolkit for composition. By intentionally disturbing default human-centered scales and timelines, the team sought to stage experiences that foreground interdependence and the agency of non-human elements. In a virtual environment this objective manifests in how assets are grouped and scaled, how transitions are timed, how environmental events trigger interactions, and how visitors come to understand themselves as part of a larger ecology.

A second objective was to develop a rigorous method for engaging with cultural collections in a manner that combines respect for provenance with willingness to re-contextualize. This required direct communication with archive holders and curators to understand permissions, historical significance, and appropriate attribution; it also required frameworks for generating new narratives that acknowledge original contexts while reframing them in pursuit of different insights. The workshops tested how curatorial and creative labor can be interleaved, building trust through transparent selection criteria, iterative review, and documented rationale for including assets.

A third objective was to establish a repeatable ideation and conceptualization process that generates promising directions from diverse perspectives. The team implemented structured brainstorming, conceptual mapping, and micro-narrative development to scaffold convergence. The process had to be inclusive of different disciplines and to produce artifacts—maps, boards, notes—that could be shared, critiqued, and extended over time.

A fourth objective was to identify and address technical challenges associated with incorporating heterogeneous formats into virtual worlds. This meant evaluating import pipelines, format conversions, coordinate system differences, anchor point corrections, and polygon counts; it also concerned the behavior of audio in spatialized environments

and the role of video as texture, backdrop, or documentary layer. The workshops worked through concrete examples to produce recommendations for LOD strategies, texture compression, and memory budgeting, all of which are indispensable to multi-user stability.

A fifth objective was to build proficiency with the IMPULSE platform and to use it as a live laboratory for multi-user co-creation. The platform's toolset for importing, placing, and modifying assets within a shared virtual space made it possible to test co-presence, versioning, and collaborative composition. The sessions also revealed user experience issues particular to multi-user contexts, such as visual clutter, conflicting actions, and the need for shared cues that communicate state changes.

A sixth objective was to align offline prototyping with online co-creation. Blender and Unity experiments generated assets, materials, and behaviors that could be imported into the IMPULSE platform. This objective ensured that insights gained in one context could be transferred to the other, with web client browsing and selection acting as a connective tissue between ideation and composition.

A final objective was to capture the process through documentation and reflection, recognizing that the documentation itself is a form of cultural production that can later be integrated into the virtual environment as a meta-narrative layer. Notes, screen captures, quick renders, and audio diaries were treated as material to analyze for design decisions and as potential content for visitors who are curious about how the environment was made.

Objectives ideation & co-creation Performing Heritage

The workshops were structured around objectives that translated theoretical commitments into practical trajectories. The first objective was to develop a speculative practice of performing heritage that would resist the reification of the past while respecting the specificity of sites. This meant devising methods for creating with heritage that do not treat it as raw material or as an immutable script. The workshops tested how livecoding, motion capture, and XR could help stage situations in which audiences and performers cohabit contested terrains of memory, seeing in action how narratives are assembled from stones, gestures, and code.

A second objective was to enact a critique of the opacity and enclosure common in commercial media pipelines by working as much as possible with libre open-source tools and sharing code where appropriate. This objective sought an alignment between the ethics of access and the aesthetics of performance. Rather than reproducing smooth digital skins that obscure their means of production, the workshops favored visible seams, explicit code, and flexible toolchains. The result was not merely a different look but a different mode of working in which performers and coders rehearsed together at the level of systems, parameters, and scripts.

A third objective was to create a process that is accountable to feminist (Krasny 2016) and decolonial analyses of heritage. In concrete terms, this required careful attention to how roles are distributed in the creative team, how stories are chosen and told, how the figure of the witch or giantess is constructed without reproducing stereotypes, and how audiences are invited to witness without extracting. In dramaturgical terms, it meant discussing how to design avatars and narrative events that complicate binary logics and foreground making-with across differences, imagining community as a negotiation among human and non-human participants.

A fourth objective was to integrate non-anthropocentric scales and temporalities in performance design. This was pursued both choreographically and computationally. Choreographically, performers explored movement tasks that bracketed virtuosity in favor of slow listening, weight-shifting, micro-adjustments responsive to sound and environment, and the bodily registering of geological imaginaries. Computationally, the team discussed the design of parameters that stretch or compress time, tune sound behaviors to drone frequencies associated with architectural resonances, and scripted environmental responses that ignore or contradict human priorities, thereby making the performer one actor among many.

A fifth objective focused on building a robust and transparent documentation practice. The goal was to collect process materials in forms that were analyzable for research and also performable. The team kept diaries, logged technical decisions, filmed rehearsals with attention to screen capture as well as room capture, and stored code versions that could be re-performed. The objective was not to produce a neutral archive but to assemble a living record capable of reactivating in future iterations of the work and illustrate how heritage becomes material under speculative conditions.

A sixth objective was to outline a pathway to public outcomes. The team defined a performance event at Ġgantija mid 2026 with AR access and a final performance-presentation end 2026. Between these endpoints, the workshops aimed to generate intermediate showings, remote tests, and experimental pilotes that could collect feedback and refine the trajectory without collapsing the experimental character of the stream into fixed deliverables too early.

Objectives ideation & co-creation Teaching & Learning

The first objective was to establish a shared foundation with institutional partners on rights, authenticity, and representation, ensuring that interpretive innovation would be built on curatorial trust rather than at its expense. The Heritage Malta workshop fulfilled this by foregrounding copyright, ownership, and accuracy alongside practical challenges of engagement and innovation in museum contexts (Clifford 1997). The second objective was to translate collection expertise into educational opportunity by identifying assets with high pedagogical potential and clarifying the conditions of their use, including digitization status, metadata quality, and sensitivities. Deep dives led by KUL, Magna Żmien, TFF, FUB, and HM addressed this goal and provided the raw material for experience design.

A third objective was to define and test collaborative learning formats suitable for a multi-user platform. The pre-hackathon and July workshops probed narrative, task-driven, and free-flowing structures and examined how each can serve different audiences and aims. A fourth objective was to articulate a focused yet flexible pedagogical frame that could unify design across partners; the exhibition as playground metaphor, combined with the themes Navigation and Bodies and the five educational areas, meets this need by condensing intentions without prescribing outcomes. A fifth objective was to embed a continuous feedback loop into platform development so that ease of navigation, manipulation, aesthetics, and provenance visibility were tested and adjusted with live input. The monthly and bi-weekly online sessions maintained this loop and kept ideation in step with technical progress.

The final objective was to lay the groundwork for replicable teaching and learning prototypes, methodology, and a playbook. This included specifying roles and incentives for participants, outlining selection and consent procedures, setting expectations

for session continuity, and documenting findings in a manner that can be transferred across institutions and scaled up or down according to resources.

7 Scope and Focus Areas

Scope and Focus Areas for Interactive Art

The scope of the interactive art stream spans concept development, content curation, spatial composition, interaction design, and technical integration, with a persistent emphasis on non-anthropocentric orientation. Central to this scope is the idea of decentering human dominance and embracing more-than-human entanglements. Nature is understood not as a backdrop but as a co-creator; cultural heritage is seen not as a fixed reference but as a living set of practices and symbols; and visitors are engaged not as passive consumers but as agents whose movement, attention, and choices shape the work. A key focus lies in 'inter-action' in space: virtual worlds are not only defined by the arrangement of digital objects but also by the ways users and other entities move within them, how interactions unfold spatially, how users encounter one another, and how guidance or constraints within the environment can support, or hinder, collective engagement. Extending beyond form, the scope also establishes an ethical framework that resists instrumentalizing heritage for novelty and emphasizes accountability to source communities and curators.

Within this scope, focus areas emerged that structure both research and making. The first focus area concerns the curatorial clustering of cultural assets. The shared board delineated categories such as Natural Elements Minerals, Human Body, Masks from African collections, Contemporary daily life, Posters, and Artworks. The significance of this focus area lies in its function as an interpretive engine: clusters become hypotheses about what kinds of relations and contrasts yield meaningful readings. For example, masks as portals signal that entry and transformation are tied to object typologies historically used for identity modulation and ritual passage. Minerals clustered with bodily imagery suggest that material continuity across nature and culture can be articulated through surface, scale, and light.

A second focus area is the experimental embedding of two-dimensional elements within three-dimensional compositions. This practice destabilizes hierarchies between image and object. When images become textures on planes, volumes, or even particle systems, they gain spatial agency: they catch light, occlude, cast shadows, and move. Similarly, by using AI-assisted proxies, an image can seed a volumetric form whose vagueness invites interpretation. This focus area is not merely a technical trick but a hermeneutic shift; it posits that images from archives can be materialized to inhabit space alongside three-dimensional scans, changing how visitors read them.

A third focus area is the assemblage of 3D modelled, and 3D scanned content into composite structures that resist totalizing interpretation. Assemblages are designed to be legible enough to invite navigation but open enough to sustain multiple readings. For example, a cluster might combine a mineral scan scaled to architectural size with smaller human-scale artifacts arranged along non-orthogonal paths, accompanied by audio fragments of interviews. The resulting assemblage shifts scale and theme, inviting the visitor to link power, resource extraction, embodiment, and memory without prescribing a single thesis.

A fourth focus area is the use of audio recordings in experimental and abstract forms. Interviews, narrations, and environmental soundscapes are deconstructed into textures, grains, and motifs that function both as content and as control signals. Audio can trigger visual events or modulate shader parameters; it can also carry language in its original form and translated variants to reveal the polyglot nature of collections. The abstraction of voice into rhythm and timbre echoes the move from literal interpretation to speculative open-endedness.

A fifth focus area is the creation of virtual spaces that do not replicate physical spaces. Rather than simulating the real world, the team builds environments that make their constructed nature evident, so that visitors are invited to think about how meaning is produced. Surfaces might show their UV seams; lighting may be deliberately non-physical; gravity might be adjusted; thresholds might transport visitors across disparate scales. Such choices decenter realism and re-center interpretation, aligning with the goal of challenging dominant narratives.

A sixth focus area is scale experimentation. Content is configured to break habituated assumptions about size relations. Mineral samples may be enlarged to landscape dimensions; a poster might be a horizon; a small carved figure might be the size of a building. This transformation is not gratuitous; it is a device to unsettle the visitor's

sense of proportion and to foreground the arbitrariness of human-centered scaling in museums and archives.

A seventh focus area is the design of interaction affordances that emphasize relationality over control. Proximity sensing, shared handles that require multiple visitors to operate, gaze-contingent reveals, or time-locked transitions driven by environmental variables all counter the tendency to equate interaction with mastery. They invite cooperative play and collective sensemaking, and they are consistent with the concept's non-anthropocentric ethics.

A final focus area is technical integration under performance constraints. The team explores format conversions, anchor point corrections, reduction of polygon budgets, texture atlasing, and audio spatialization so that the virtual environment remains performant in multi-user settings. The challenge of heterogeneous formats becomes an opportunity to design pipelines that are documented, repeatable, and transparent, resulting in recommendations for the IMPULSE platform's import tools and runtime optimizations.

Scope and Focus Areas for Performing Heritage

The scope of the performing heritage (Friberg, Parekh-Gaihede, and Barton 2010) stream spans conceptual orientation, artistic method, technical infrastructure, and site-specific dramaturgy. At its core lies the overarching question: what changes in the nature and inherent relationships of performative art when its spatial-temporal environment is not only displaced in time, as with heritage, but also transposed into a virtual rather than a physical space? Conceptually, this stream begins from the recognition that inherited narratives of cultural heritage often stabilize power and marginalize alternative accounts. When translated into virtual environments, these dynamics are not neutralized but reconfigured, as the medium itself can amplify, obscure, or redistribute authority. The critical theory of technology employed here becomes a tool for interrogating not only historical narratives but also the infrastructures of virtual space. By insisting on open-source ecosystems and by projecting code, the stream resists authorial opacity, foregrounds the conditions of digital making, and asks how expertise, access, and authorship are redefined when performance unfolds in computational rather than material space. This is not simply a stylistic decision, but a redistribution of agency that unsettles the authority of both heritage and its virtual staging.

Within this conceptual scope, glitch aesthetics operate as more than technical accidents; they emerge as dramaturgical strategies that foreground the unstable nature of virtual

environments. Glitches expose fractures not only in computational systems but also in the cultural and historical frameworks that such systems mediate. In physical heritage sites, performance already negotiates uneven relationships with the past; in virtual environments, glitch aestheticizes the additional instability of digitally mediated presence. Designing for latency, compression artifacts, aliasing, or broken synchrony acknowledges that virtual space is neither seamless nor immaterial but a site of friction where meaning is co-constructed by performer, system, and audience. The glitch thus reframes virtual space as a performative condition in its own right, one that insists on truthfulness about technological mediation while questioning what continuity, fracture, or embodiment mean when time and space themselves are simulated.

The artistic method is practice-based, improvisatory in detail yet rigorous in frame, and it is here that the implications of virtual spatiality are most directly tested. Cycles of ideation, prototyping, reflection, and iteration unfold not only in relation to physical heritage sites but also in their re-imagining within computational environments. A story session might begin with: what would it mean to enter the Mnajdra complex as if it were tuning itself to celestial rhythms across scales inaccessible to human perception? In virtual space this does not simply recontextualize the site but reconstitutes its dramaturgy: avatars may move asynchronously, a mineral field may be given agency, or temporal causality may be stretched so that consequences appear minutes later, fracturing familiar logics of action and effect. Documentation and reflection then focus not only on how performers resist or recenter anthropocentric tendencies, but also on how the virtual environment itself shapes, constrains, or enables new relationalities. In this way, the method becomes a continuous inquiry into how performance as a temporally and spatially defined art form is transformed when its stage is not material ground but computational simulation.

Site-specific dramaturgy occupies a major focus area. The Maltese temples are engaged as interlocutors. Ġgantija's (Vella, Cilia, and Heritage Malta 2013) mass and spatial arrangement suggest relationships between ground plane and sky, between enclosure and exposure. In speculative terms, this becomes a question of how an avatar the height of a giantess would inhabit space in AR and how the scale mismatch might make human spectators feel themselves as one element among others. One dramaturgical device is to have the avatar composed of semi-transparent wireframes whose density varies in response to low frequency drones, a moment where stone's imagined resonance has the power to make visible more or less of the avatar. The human performer's motion would not directly command the avatar but would seep into it through probabilistic mappings with delays, making the relation one of influence rather than control.

Mnajdra's alignments prompt a different dramaturgy of timing. Here the focus may be on light as choreography, with AR layers designed to appear only at certain angles or under certain site-specific constraints, echoing how the temple enacts alignment. The narrative language drifts toward cosmology not as metaphor but as practice, where avatar geometries unfold according to orbital logics rather than human narrative arcs. The performer's task becomes inscribing traces that do not demand immediate response but deposit cues that a delayed system will surface later, perhaps when the audience has moved on, creating an echo that resists instant comprehension.

Hal Saflieni suggests a dramaturgy of resonance. The stream speculates that drones near 110 and 114 Hertz can be composed as thresholds, frequency doors that alter perception when sustained. In technical terms, these drones modulate the amplitude envelopes of SuperCollider grains and alter the phase relationships in spatialized audio, creating subtle rotational movements felt more than heard. In performance terms, the human performer may submit to these frequencies rather than direct them, letting the body be pulled into micro-movements aligned with standing waves. In XR terms, slight field-of-view distortions or shader phase shifts might pulse at sub-perceptual intervals, making visibility itself breathe with the drone.

The scope also includes careful attention to ethics and access. Because the stream engages heritage sites, it insists on non-invasive, reversible interventions. AR is suited to this constraint. Documentation practices avoid exposing sensitive details and are designed to be de-identified where required. The choice of open tools and the desire to present performances through phones and tablets whenever feasible speak to a commitment to accessibility beyond specialized audiences. The stream also recognizes the need to articulate the difference between speculative interpretation and historical claim, ensuring that audiences understand that fabulation is not a replacement for research but a way to keep heritage alive as a site of imagination and care.

Scope and Focus Areas for Teaching and Learning

The scope of this stream spans collections exploration, pedagogical framing, co-creation formats, ethical guardrails, and platform-specific design. It begins with the principle that learning experiences should not abstract artifacts from their contexts but instead render both archival and original contexts visible, discussable, and dynamic. This includes not only the curatorial frameworks of collections but also the temporal-spatial conditions in which artifacts were first created, used, and transformed over time. Virtual worlds expand this horizon by enabling learners to engage with these shifting contexts

in embodied, spatially situated ways, moving through reconstructed environments, tracing an artifact's historical trajectories, and experiencing its entanglement with place.

Within this scope, the first focus area is the alignment of collections and pedagogy. The workshops sought thematic and pedagogical links across holdings, such as connecting navigational instruments from the Maritime Museum (Conti and Cilia 2006) with poster imaginaries, or linking amateur films of family outings to prehistoric sites in the Magna Żmien archive (Carotenuto 2023) with conversations about access, embodiment, and memory. When situated in virtual space, these links are not only conceptual but also spatial: learners can navigate between dispersed artifacts, encounter them in relation to one another, and reflect on the layered temporalities they embody (Aikla 2024).

Equally important is the role of movement in virtual learning environments. Research has shown that physical movement can reinforce learning processes; virtual worlds suggest that similar effects may arise when navigating computational space. Because our sense of balance cannot distinguish fully between movement in virtual and physical contexts, as demonstrated by phenomena like motion sickness, the embodied effects of virtual motion can be used deliberately to enhance learning. Guided navigation, collaborative exploration, or the act of moving through temporal reconstructions of sites can anchor memory and understanding in ways that static media cannot. The challenge lies in leveraging these spatial-temporal affordances without trivializing them as spectacle, instead treating them as opportunities to deepen comparative learning, cross-media thinking, and embodied engagement with heritage.

A second focus area is the operationalisation of the educational areas inside the virtual environment. Each area is not simply presented as content but translated into interactive, spatial, and participatory forms of learning. Historical information is introduced as layered context, inviting users to situate artifacts within broader narratives and to debate how histories are constructed, rather than treating the past as static facts or trivia. Design teaching is embedded in processes of making and critique, where users can experiment with form, function, and aesthetics directly in the environment, receive feedback, and reflect on the iterative nature of design practice. Curatorial methodologies are made transparent through the exposure of workflows, choices, and dilemmas, users can observe and even participate in decisions about selection, arrangement, and interpretation, demystifying how exhibitions come into being. Archival practice becomes experiential through tasks of labeling, describing, and categorizing, which not only build skills of documentation on how metadata shapes accessibility, meaning, and memory. Finally, visual culture and critical thinking are cultivated through asking learners to closely analyze images, films, and digital media, interrogating bias, framing,

omission, and perspective, thereby reinforcing the critical literacy needed to navigate both cultural heritage and contemporary media landscapes.

A third focus area is collaborative practice on digital platforms. Here the stream examines how co-presence cues, shared tools, and role-based access can enable peer-to-peer learning. The system thus trains learners to hold multiple viewpoints and to understand that what they see is shaped by their position and task.

A fourth focus area is affect and atmosphere as pedagogical vectors. The stream treats sound, spoken word, pacing, and light as legitimate means to structure attention, support memory, and invite reflection. Spoken words' musicality and emotion can carry meaning even across languages, while ambient sound can delineate space and mood better than dense text overlays. This focus rejects a false dichotomy between facts and feelings and argues that well-composed atmospheres can deepen learning.

A fifth focus area is ethics and power in collections. Workshops repeatedly confronted colonial dehumanization and problematic content. The scope therefore includes procedures for contextual warnings, updating notes, and reflective prompts that ask why certain images were made and preserved and how to avoid harm. It also includes policies for when not to show material or when to reframe it decisively, alongside pathways for community input and correction.

A sixth focus area is materiality and disintegration in digital space. Learners are invited to engage with fragility, decay, and repair as themes, exploring how damage can be reversed, reenacted, or reimagined online and what such acts imply. Activities might ask users to stabilize a disintegrating object, reconstruct from fragments, or critique the impulse to fix and perfect.

A seventh focus area is accessibility and agency. The scope requires ease of entry for older users and new audiences, straightforward access to information at different depths, and interface designs that let users choose their path while gently encouraging collaboration. Agency is framed as the capacity to inquire, to connect, and to contribute, not merely to manipulate.

A final focus area is platform feedback and iteration. The stream explicitly includes checkpoints for critiquing navigation metaphors, manipulation mechanics, and aesthetic coherence. It treats state indicators, undo, and version checkpoints as necessary infrastructure for safe experimentation and co-creation.

8 Target Participants

Target Participants Interactive Art

The interactive art stream addresses artists specializing in digital media, sound, and spatial practices who are seeking models for engaging cultural heritage ethically and experimentally. These artists benefit from a detailed account of methods for ideation, curation, assemblage, and interaction design that foreground non-anthropocentric orientation and co-creation. They also gain practical guidance on working with heterogeneous formats in multi-user environments.

Curators and archive holders constitute a second audience. For them the stream offers a pathway for collaboration that acknowledges stewardship duties and leverages their expertise at moments of selection, contextualization, and interpretation. The methods described here provide mechanisms for traceability of sources, iterative curation, and documentation of rationale for inclusion, exclusion, and modification, thereby building trust in artistic processes that are often perceived as opaque.

Researchers in interactive audiovisual arts, human–computer interaction, and digital heritage represent another audience. They can draw on the report's systematic mapping of interaction affordances, multi-user design patterns, and speculative narrative strategies as a basis for further investigation. The stream's emphasis on non-anthropocentric design contributes to current debates in design research about post-human-centered methods and their ethical implications.

Educators and students in art, design, and cultural studies form an important audience because the workshops' processes can be reconfigured as teaching modules. The shared board, conceptual mapping, and micro-narrative exercises can be adapted for classrooms; the technical pipelines can be simplified for introductory contexts while retaining the conceptual intent; and the documentation practices can be adopted as core reflective tools in studio pedagogy (Sedgwick 2003).

The general public (von Osten 2011) is a vital audience for the eventual virtual environment deployments. Visitors encounter not only cultural assets but also the dynamic relations and processes that animate them. The stream's user experience choices aim to balance clarity with openness, providing accessible entry points for diverse participants while sustaining depth for those who wish to probe further. Importantly, the design also positions visitors not as passive recipients but as potential co-curators:

they can annotate, connect, or reinterpret materials, thereby contributing to evolving narratives of cultural heritage. This participatory approach breaks down established hierarchies between expert and non-expert, reframing interpretation as a shared, negotiated process. In multi-user settings, these contributions become collective acts of engagement, turning cultural interpretation into an ongoing dialogue rather than a solitary or authoritative pronouncement.

Platform developers and technologists connected to the IMPULSE ecosystem are an audience because the report identifies specific opportunities for improving import pipelines, asset handling, collaborative tools, and runtime performance. The technical challenges enumerated here translate into actionable requirements and feature requests that can guide development in a user-centered, artist-informed direction.

Target Participants Performing Heritage

The performing heritage stream addresses artists who work across performance, sound, code, and digital fabrication. For these artists the stream provides a vocabulary and a toolkit for approaching heritage without nostalgia and without surrendering to technophilic spectacle. It offers models for integrating livecoding into dramaturgy, for building XR experiences that foreground process, and for constructing avatars whose identities are hybrid and resistant to reductive representation.

Curators and heritage practitioners are addressed as partners in rethinking how collections and sites might be activated. The stream offers procedures for dialoguing with materials and places, for building performances that sit alongside sites without overriding them, and for generating documentation that can be archived as part of an evolving record. It suggests that co-creation with artists, programmers, and performers can yield a more nuanced public engagement with heritage than can static displays alone. It also models how ethical constraints can be productively transformed into dramaturgical constraints.

Scholars and researchers in performance studies, media art, digital heritage, and science and technology studies will find in this stream case material and conceptual frames for examining how critical theory of technology can be enacted in practice, providing enough detail about toolchains, mappings, and rehearsal techniques to support academic analysis, while the theoretical orientation invites dialogue about non-anthropocentrism, posthuman feminism (Lothian 2006), and decoloniality in relation to XR.

Educators and students are important audiences because the stream turns its methods into reproducible workshop formats. An educator could re-stage the ideation and livecoding exercises, assign documentation tasks modeled on those described here, and adapt the motion capture to widely available cameras. Because the tools are open, students can work at home or in labs without licensing barriers, enabling wider participation and integrating technical learning with critical discourse.

The public is the audience for whom the performances are ultimately made. Designing AR experiences that can be accessed through personal devices acknowledges that many people will not own headsets and that cultural institutions often wish to avoid or limit specialized hardware. The public is invited into a new relationship with heritage in which watching is accompanied by witnessing how something is made. By positioning code and process as visible, the stream respects audiences' capacities to engage with complexity rather than shielding them from it.

Developers and open source communities form another audience, in which tool interoperability matters under performance conditions and how livecoding workflows intersect with game engines and audio synthesis. The feedback loop is mutual. Developers can learn which features support artists' needs in XR performance, and artists can learn how to contribute back to codebases, documentation, and community support channels.

Target Participants Teaching and Learning

The primary audience consists of university teachers and students in history, anthropology, humanities, media, design, and museum studies who will pilot the reciprocal learning model. They are positioned not as recipients of content but as co-authors of interpretation, sharing responsibility with curators and archivists for how objects are contextualized.

A second audience is GLAM professionals—curators, archivists, educators, and exhibition designers—who will use the methodology and playbook to facilitate innovative engagement scenarios and to port less-visible collections into collaborative digital spaces.

A third audience comprises digital artists, game designers, and technologists whose expertise in interaction, world-building, and aesthetics can elevate educational

prototypes and whose practice can, in turn, be reshaped by curatorial ethics and archival realities.

A fourth audience includes school educators and lifelong learners, who can benefit from accessible, scaffolded experiences that foreground inquiry and co-creation. In addition to guided exploration, the design emphasizes peer-to-peer learning, where participants exchange interpretations, compare perspectives, and build knowledge (Borgdorff 2010; Haraway 2013) collaboratively. Such reciprocal engagement not only deepens understanding but also models dialogical forms of education that extend beyond hierarchical teacher–student dynamics. Feedback from these groups further informs the simplification or deepening of modules, ensuring that the learning pathways remain responsive to diverse needs and levels of expertise.

A fifth audience is platform developers and HCI researchers, for whom the stream's feedback on navigation, manipulation, provenance display, and collaboration tools translate into concrete requirements and research questions. Finally, community stakeholders, including source communities and audiences represented in the archives, are an essential audience and interlocutor, especially when addressing colonial legacies and alternative histories. The stream anticipates participatory pathways for these stakeholders to influence how materials are presented and interpreted and to contribute new contextual layers and corrections.

9 Activities

Activities Interactive Art

The workshops were organized into a sequence of settings that scaffolded ideation, curation, composition, and evaluation. The first setting consisted of online ideation sessions in which participants used collaborative boards to capture concepts, group assets, and draft micro-narratives. Structured activities included time-boxed brainstorming around the theme of non-anthropocentric perspectives, pairwise critique of proposed asset combinations, and collective mapping of narrative arcs at different temporal scales. Dialogue with curators and archive holders occurred in this phase,

providing insight into provenance and constraints and prompting specific questions about how to responsibly re-contextualize artifacts associated with power hierarchies.

The second setting involved deeper engagement with cultural collections through the collaborative board. Assets were grouped with thumbnails, links to source collections, and annotations. The team recorded for each group the relevance to the concept, potential for reinterpretation, and plausible interaction motifs. For example, the Masks group was annotated with design prompts about portal mechanics, perspective shifts, and sound attachment strategies. The Natural Elements Minerals group generated prompts about scale manipulation, slow temporal transitions, and surface-driven illumination changes. Cross-links were drawn between groups to indicate narrative bridges and potential co-activation rules that could be implemented in the virtual environment.

The third setting comprised offline experiments in compositional assembly and responsiveness. Artists used Blender to create small-scale assemblages in which 2D images were embedded as textures and decals on low-poly proxies, and where 3D scans were decimated, re-anchored, and remeshed to achieve performance targets. Unity 3D was used to prototype interaction behaviors such as proximity triggers, gaze-based reveals, and group-operated handles. These tests served as proofs of concept that informed the subsequent multi-user implementation.

The fourth setting was the IMPULSE multi-user virtual reality platform. Here, participants collaborated in a shared virtual environment to import assets, place them within scene graphs, and test interaction affordances with co-present users. The platform's tools were used to iterate spatial composition, evaluate sight lines, and test how concurrent manipulations affected narrative coherence. Because multi-user contexts introduce challenges of coordination and conflict, the team developed light-weight protocols for turn-taking, annotation, and state indication so that changes to assets or interactions would be legible to all.

The fifth setting was the web client, which functioned as a bridge between curation and composition. Participants browsed available assets, reviewed metadata, and prepared shortlists for import into the virtual environment. The client enabled asynchronous review, allowing team members to propose additions or substitutions and to document why certain assets were preferred in relation to the concept. This record formed part of the documentation corpus.

Across all settings, engagement strategies emphasized co-presence, shared authorship, and reflective practice. Activities included guided walkthroughs of compositional proposals, critique sessions where interaction affordances were tested and evaluated for clarity and conceptual fit, and documentation rituals such as end-of-session debrief notes and screen capture archiving. The teams also performed stress tests to observe how the virtual environment handled increased asset counts and simultaneous interactions, and they tuned LOD thresholds and culling rules accordingly.

The activities culminated in the articulation of an initial concept for a multi-user virtual environment that integrates re-appropriated cultural heritage artifacts and digitized natural elements. The concept specifies that visitors will encounter clusters of assets whose scales and audio behaviors follow non-human temporalities; that certain artifacts, such as masks, will function as portals leading to alternative vantage points or temporal frames; that audio recordings will be present both in legible and abstracted forms, sometimes as language and at other times as texture that modulates environmental state; that 2D images will not be relegated to walls or panels but will inhabit space as textures, projections, and reconstruction seeds; and that visitors will occasionally be required to act collaboratively to unlock narrative shifts, thereby making interpretation a social act.

The team documented a set of technical and curatorial recommendations. On the technical side, they recommend establishing standardized import profiles for common formats, with presets for coordinate normalization, pivot alignment, decimation ratios, and texture compression parameters; adopting a scene organization convention that separates narrative logic from visual assets to ease iteration; and implementing cross-asset linkages through a lightweight rule system that allows events in one cluster to affect states in another. On the curatorial side, they recommend maintaining traceability of sources and decision rationales through the board's annotations; revisiting selections as the concept evolves to avoid early lock-in; and recording both affirmative and negative decisions to preserve a history of interpretive choices.

The workshops also surfaced open questions for future development. How can the IMPULSE platform better support asynchronous collaboration where state changes can be reviewed, accepted, or rolled back? What evaluation instruments best capture whether non-anthropocentric design is perceivable and meaningful to visitors? How might AI-assisted reconstruction be deployed responsibly, with clear labeling and provenance tracking, to extend the expressive palette without obscuring original contexts? These questions will guide subsequent cycles of artistic research (Kaila et al. 2017) and platform improvement.

In conclusion, the interactive art stream demonstrates that speculative methods, co-creation, and careful technical integration can produce virtual environments that allow cultural (Schulze and Waltenspül 2025) heritage assets to be experienced as part of living, shifting assemblages. By decentering human mastery, amplifying more-than-human scales and temporalities, and foregrounding relations over objects, the workshops have generated a foundation for interactive artworks that are both aesthetically generative and ethically attentive, providing a roadmap for continued development, offering a synthesis of conceptual stance, practical methodology, and technical know-how that can be taken forward within IMPULSE and adapted by practitioners across the broader field of interactive audiovisual arts.

Activities Performing Heritage

The workshops began with a sequence of meetings dedicated to shared reading, story exchange, and theoretical framing. Participants read texts that informed the stream's conceptual stance, discussed how anthropocentrism structures both heritage and technology, and articulated personal lines of inquiry. The story exchanges were not brainstorming sessions in the conventional sense but careful compositional situations in which each participant offered scenes, images, and phrases that mattered to them in relation to the Maltese sites (Magri, Fenech, and Schembri 2006). From these exchanges emerged a working set of narrative vectors: a giantess bridging stone and sky, a witch whose power is not domination but making-with, a temple (Veen 1994) that is a clock for more-than-human timing, a resonance that teaches bodies to listen differently.

Early technical sessions focused on setting up MOCAP. The team experimented with different camera configurations, lighting, and capture spaces to secure clean skeletal data without imposing theatrical lighting that might pre-structure performance too rigidly. A simple mapping was first tested in which hip and shoulder rotations produced control signals for amplitude and filter sweeps, while wrist velocities controlled granulation density. This immediate sonic feedback cultivated an embodied sense of how motion writes sound, and rehearsals quickly produced intuitions about which gestures generated flat or noisy responses. The team refined ranges and smoothing to avoid over-responding to micro shakes and to keep a slow, drone-like sound world in tune with the resonance dramaturgy. The rehearsals cultivated a team habit of verbalizing decisions in real time, naming not only what changed but why it changed, enabling a shared memory of causal chains that will later be invaluable in refining the performance.

As the speculative dramaturgy deepened, site relations were considered more concretely. For Ġgantija, a mockup space was discussed to approximate spatial constraints and to test AR visibility under changing lighting. The rehearsal process included exercises in which the performer was asked to imagine the avatar as an independently existing presence whose density fluctuations could be felt as pressure or lift. Mnajdra rehearsals shifted attention to timing. A set of rules tied visual appearance to angles between the sun's simulated path and virtual apertures, a dramaturgical exercise that familiarized the team with thinking in astronomical increments rather than theatrical cues. The performer's challenge was to improvise within an environment whose responsiveness was structured in larger units of time, producing poetics of deferred consequence. The rehearsal shows how this altered the type of attention required of both performer and audience. Performers could not rely on direct cause and effect but had to accept a system that would answer in its own time, as if the temple itself had the final say.

The plan for the 2026 events emerged from these activities and is conceived as both an artistic intervention and a contribution to IMPULSE's overarching research questions. Mid-2026 is reserved for an AR performance at Ġgantija. While in-situ and site-specific, the event is designed to test more general questions about how digital performative heritage can unfold within XR environments. The performance, envisioned as intimate, invites a select audience to engage via headsets or tablets with a giant pan-gender shaman-witch avatar, its form animated through pre-rendered sequences in Blender and enhanced with responsive layers built in Godot. The performer's motion, tracked through MOCAP, will feed into SuperCollider for reactive sound and into the avatar's visual layers for density modulation. Delivering sound through headphones preserves the site's natural soundscape, allowing the research to probe how digital augmentation can co-exist with and not overwrite heritage environments. Documentation will be comprehensive but discreet, combining screen capture of AR layers with wide-angle video that minimizes intrusion, thereby supporting later analysis of how audiences negotiate the dual presence of heritage and XR.

Throughout the project, documentation will be compiled into a collection that becomes the empirical basis for reflection in the final phase of IMPULSE. This includes code versions, rendering tests, rehearsal videos, audio diaries, and textual reflections, preserving both the creative context and the technical specifics. By making the process as visible as the product, the archive allows the project to contribute beyond its site-specificity: it enables comparative analysis of workflows, technical pipelines, and dramaturgical strategies relevant to XR performance more broadly. The final performance-presentation at the end of 2026 will synthesize movement material from Ġgantija, video from the documentation archive, and live XR fragments scaled

for projection and sound. This event will serve as a test case for how XR-based performative heritage can travel beyond its original site while still retaining transparency, co-creation, and speculative reinterpretation as methodological anchors.

The workshops' engagements and activities thus form a continuous thread from theoretical commitment to practical outcome, positioning the Ġgantija AR project as both a specific experiment and a generalizable inquiry. It directly addresses IMPULSE's research questions by examining how posthuman feminist and decolonial (Trinh 1989) frameworks reshape digital heritage performance, how libre tools and livecoding can be integrated into dramaturgy, and how non-anthropocentric design can be instantiated in timing, mapping, and agency distribution. More broadly, it demonstrates how XR environments mediate the relationship between audiences, performers, and sites, and what kinds of knowledge emerge from these mediated encounters. The work neither monumentalizes the past nor erases it; instead, it stages a research process in which the memory of stones, code, and bodies becomes both artistic material and evidence for theorizing the future of digital performative heritage.

Activities Teaching and Learning

The offline settings structured the program's cadence and deepened the team's grasp of institutional and pedagogical realities. The Heritage Malta workshop in December 2024 functioned as a threshold moment. Participants toured physical and digital holdings, viewed an existing immersive experience at the Maritime Museum, and discussed ownership, copyrights, authenticity, and accuracy. The group examined dockyard collections that intermix voice recordings, drawings, and digital surrogates, and navigational instruments whose technical histories demanded careful interpretive framing. The day concluded with a shared understanding that immersion adds value when it clarifies context and invites inquiry and that experimentation with assets online must visibly preserve provenance and curatorial voice.

The Leuven pre-hackathon in February 2025 emphasized fast-cycle ideation within guardrails of curatorial rigor. Teams integrated assets from different partners and developed early concept frames. One team worked on glass slides of ancient sites from KU Leuven, debating whether to anchor activities in the slides as objects or in the depicted sites. They resolved to do both, embedding slide characteristics into projected light and texture while composing the environment from site plans and landscapes. Their concept employed roles that rotate across levels so that users inhabit multiple perspectives and discover the subjectivity of interpretation. Target users were identified as third-level students in political history, anthropology, and humanities.

Activities ranged from jigsaw-style reconstruction and free composition with shapes to metadata attribution and curating (Kolb 2024; Orr 2018; Pierce 2013) personal collections for sharing. Visual and physical characteristics included spiral and circular frameworks, maze-like environments derived from temple floor plans, diurnal atmospheres, and mechanisms for getting lost and reorienting. Sound design extended beyond ambience to object-emitted sounds and haptic-like difficulty in traversing sand or mud. The team's critical reflection acknowledged the tension between goal-based games and free exploration, the differing needs of younger and more studious audiences, and the incomplete discussion of co-creation and ethics. Requirements and recommendations emphasized collaborative manipulation, material properties for virtual objects, variable information depth, accessibility features, purposeful glitches, and careful participant selection and facilitation in subsequent sessions.

The July workshops in Valletta, hosted at Unfinished Art Space Studio and co-led by artists (Hutschek 2023) and educators, concentrated on translating game dynamics into curatorial and pedagogical practices within a virtual world. Datasets from multiple partners were presented, including Heritage Malta oral histories, Magna Żmien film linked to prehistoric sites, KU Leuven glass slides, FUB interview clips, a Jagiellonian collection of navigation instruments, and TFF posters. The research questions probed creative restriction and agency, aesthetics and world-building, multi-sensory narrative design, what to augment in representing heritage, levels of visitor agency, curating (Kolb 2024) with meaningfully chosen mechanics, cross-medium translation, the role of movement and social interaction, and the unique affordances of virtual space. The feedback was clustered around ten recurring subjects. In access and accessibility, participants advocated for equal entry for older users, easy on-ramps, and staged information depth. In limits and boundaries, they argued that constraint can focus learning and creativity, while openness can support exploration; both can coexist as options. In affect and user experience, they emphasized sound, spoken word, and ambience as central to engagement and suggested long-duration worlds that mirror heritage renewal cycles. In atmosphere and spoken word, they highlighted the emotional charge of voice even across language barriers. In materiality and disintegration, they saw fragility as a fertile ground for activity design and debated the implications of reversible damage online. In power dynamics, they insisted on confronting colonial dehumanization and contextualizing problematic content through updating notes and reflective framing. In alternative histories and diversity, they encouraged humor where appropriate, celebrated amateur film as a lens on everyday life, and favored personal stories and imaginative sparks. In community and creativity, they proposed collaborative painting, crowd-sourced reconstruction akin to the Palmyra Project, and connecting artifacts to provide emergent context. In community (Borg 2023) and collaborative space, they advocated moving beyond representation toward adaptation and creation, welcomed

the aesthetic pleasure of open, wall-less worlds, and noted that familiarity can strengthen ownership. In speculation and storytelling, they embraced speculative engines for curiosity while warning against flattening truth; they proposed clear signposting of interpretive layers and repurposing assets to deepen learning.

The workshops with heritage curators will operationalize co-design inside the platform. They will test curator-facing workflows for bringing exhibitions and metadata into the VE, establish templates for learning activities that curators can adapt without heavy technical mediation, and negotiate how Navigation and Bodies can be curated across institutions while preserving each partner's interpretive voice. These sessions will also address evaluation, agreeing on instruments that can capture interpretive shifts, collaborative dynamics, and the effectiveness of affective atmospheres in supporting learning.

Online settings provided the scaffolding for continuity. Monthly sessions from March 2025 assembled IMPULSE team members for extended creative work around WP1.3, beginning with asset investigation and layering on educational framing and co-creation as the platform evolved. From May 2025, bi-weekly sessions with the core team kept momentum high, synchronized tasks, and enabled rapid feedback on platform iterations. The team used Miro boards for concept mapping and an online database for assets and references, including rights status, technical notes, and proposed educational uses. Keeping ideation artifacts adjacent to asset registries helped balance imagination with feasibility and ensured that design choices remained accountable to provenance and constraints.

As the platform is maturing, a subset of online sessions became hands-on laboratories. Participants imported assets, tested navigation and manipulation, and critiqued visual hierarchy and provenance display. Live feedback emphasized transparent transitions between browsing, examining, and co-creating, and requested collaborative affordances such as light-touch check-in and rollback mechanisms. The sessions produced the first ideation document proposing a way forward for design and development that integrates the educational areas, the themes of Navigation and Bodies, the exhibition as playground metaphor, and the platform's evolving affordances.

In this stream, teaching and learning are understood as iterative, negotiated, and affectively rich practices. The settings and engagements described above show how institutional grounding, partner deep-dives, cross-disciplinary design, and continuous online collaboration can yield a transferable methodology and concrete pilotes/prototypes. The combination of curatorial ethics, speculative interpretation, collaborative formats, and careful platform feedback positions the project to pilot

a use case for reciprocal learning with teachers and students, to produce a playbook for GLAM partners, and to populate inclusive multi-user environments with assets that are interpreted not once and for all, but together and anew.

10 Conclusion

Summary of Key Findings and Insights

The ideation and co-creation workshops conducted across the three streams — Interactive Art, Performing Heritage, and Teaching & Learning — collectively demonstrated that cultural heritage can be reinterpreted and reactivated through immersive, participatory, and speculative approaches. The results confirm that digital environments, when grounded in artistic research and open-source ethics, can enable new forms of engagement that are simultaneously creative, critical, and inclusive.

Across the streams, several common insights emerged:

- Non-anthropocentric orientation: Each stream effectively decentered the human as the sole subject of heritage experience. Whether through mineral-scale environments in virtual space, the choreographies of more-than-human agents, or the pedagogical framing of interdependence, this approach offered new interpretive possibilities.

- Participatory co-creation: The workshops validated collaborative authorship as a methodological driver. Artists, curators, technologists, and educators operated as equal contributors in the conceptualization and testing of ideas.

- Transparency and open-source practice: Technical choices consistently aligned aesthetics with ethics, prioritising accessibility, process visibility, and interoperability.

- Speculative fabulation as method: All streams confirmed the productive potential of speculation, storytelling, and fabulation for reframing heritage as an imaginative field rather than a static archive.

- Documentation as active research: Continuous documentation was not treated as ancillary but as an integral creative practice, producing materials that will feed directly into upcoming prototypes and dissemination.

Collectively, the workshops provided the methodological foundation for the next phase of IMPULSE. They transformed abstract principles — co-creation, critical digitality, and inclusive engagement — into tested practices, toolchains, and thematic frameworks that now inform the project's prototype development.

Insights from the Three Streams

Interactive Art Stream

This stream established how immersive, interactive audiovisual environments can embody non-anthropocentric thinking. By integrating heterogeneous cultural assets — including 2D imagery, 3D models, sound, and video — into a unified multi-user virtual space, the team demonstrated the technical feasibility of multi-modal co-creation.

The use of shared curatorial boards and collaborative VR sessions allowed transparent asset selection and spatial composition, while speculative scaling and interaction models reframed perception itself as part of the narrative.

Key insight: artistic research can operationalise philosophical concepts (e.g. more-than-human ecologies) through concrete design parameters such as scale, timing, and interactivity. The resulting methodology will directly inform the next prototype's compositional logic and its user experience design within the IMPULSE platform.

Performing Heritage Stream

The performing heritage activities proved that live, speculative performance can serve as a research method for rethinking cultural memory. Situated in Maltese megalithic sites, the stream combined motion capture, livecoding, and XR dramaturgy to develop a framework for performing with rather than about heritage. Glitch aesthetics, open-source pipelines, and feminist-decolonial theory converged in a practice that exposes the material, political (Davis 2010), and affective layers of digital performance.

Key insight: performance becomes a medium of critique and care when process transparency, embodiment, and technological friction are treated as artistic values. This stream provides the conceptual and technical baseline for the 2026 AR performance prototype at Ġgantija, linking physical site, speculative narrative, and modular open systems.

Teaching and Learning Stream

This stream translated co-creation principles into pedagogical and curatorial practice. Through hybrid workshops and hackathon-style sessions, participants developed reciprocal models of education in which learners and experts jointly interpret digitised collections. Two thematic anchors — *Navigation* and *Bodies* — provided coherence, while the metaphor of *exhibition as playground* articulated a transferable pedagogical frame that legitimises exploration and co-creation.

Key insight: collaborative learning environments can merge curatorial rigour with creative openness when provenance visibility, accessibility, and affective engagement are treated as design priorities. The framework generated will guide the educational prototypes for the IMPULSE platform, ensuring that multi-user interaction supports both learning outcomes and ethical engagement with heritage data.

Main Lessons Learned

Several cross-cutting lessons were identified during synthesis and internal review:

1. Interdisciplinarity as operational condition. The convergence of artistic research, heritage curation, and digital design required sustained mediation between vocabularies

and expectations. Effective co-creation depends on clear communication tools (shared glossaries, visual boards) and iterative testing cycles.

2. Ethics and provenance as enablers, not constraints. Rather than restricting creativity, transparent acknowledgement of rights, authorship, and historical context fostered trust among partners and strengthened the legitimacy of outcomes.

3. Speculative approaches increase engagement when grounded in accuracy. Participants and audiences responded positively to imaginative reinterpretations when these remained accountable to verifiable data and clearly signposted as interpretive.

4. Accessibility and diversity remain central challenges. While the workshops improved inclusion through hybrid participation and open tools, future prototypes must further address sensory accessibility, language variation, and device diversity.

5. Documentation must serve multiple functions. Workshop records, audiovisual logs, and technical notes will not only feed academic evaluation but can also become assets within prototypes, allowing audiences to trace how cultural experiences are made.

6. Scalability requires modular infrastructure. The success of hybrid and remote co-creation highlights the importance of open, modular, and lightweight toolchains that can be reused across contexts and partner institutions.

Concluding Remarks

The ideation and co-creation workshops have fulfilled their purpose as the conceptual and methodological engine of the IMPULSE project's first phase. They generated a shared vocabulary, a robust set of practices, and a network of collaborators that collectively reposition digital heritage as a field of experimentation, care, and participation.

The transition from ideation to prototyping marks a critical shift from exploratory experimentation to demonstrable implementation. Future work will translate speculative insights into functional, accessible prototypes capable of engaging diverse audiences and sustaining cross-sector collaboration. The emphasis on non-anthropocentric ethics, open technical infrastructures, and participatory design will remain central to this trajectory.

11 Appendix: Workshop documentation, reports

Deliverable 1.5 report for Artistic Research Prototype - Artistic research methods in the direction of Interactive Audiovisual Arts

In Task 1.2, the NKUA team investigates one direction of artistic research relating to interactive audiovisual arts. The team applies the method of artistic research in order to explore ways in which digital media artists engage with cultural heritage (CH) assets and provide different insights, narratives and interpretations of these assets. They also identify challenges related to the incorporation of the assets in Virtual Environments (VEs), in order to provide recommendations on their further use in artistic projects.

Ideation & Conceptualization

The ideation and conceptualization processes included a series of collaborative online sessions, with the main goals of exchanging perspectives, developing concepts jointly, and exploring creative possibilities. The engagement with the available cultural heritage assets and the dialogue with the curators of the collections were essential for these sessions. The collaborative aspect of the process ensured that the ideas generated were not only innovative but also reflective of a diversity of viewpoints. Through structured brainstorming, conceptual mapping and creation of micro-narratives, participants were able to converge on a set of promising directions for further exploration.

An important dimension of the sessions involved engagement with cultural collections and research of each archive's content. Through direct communication with archive holders, the team gained deeper insights into the available cultural assets, their original context, their historical and cultural significance, and the practical considerations involved in their use. These dialogues ensured that conceptual development was informed by information related to the original context of cultural heritage assets. It also facilitated team members to articulate new narratives around specific cultural assets and reinterpret them in new contexts.

Building on this foundation, an initial concept was formulated for one of the multi-user virtual environments. The concept emerged by grouping similar, recurring ideas shared by all members of the team, such as non-anthropocentric perspectives, emphasis on Human - Nature interconnectedness and challenging of dominant narratives. Regarding the methodology, the team decided to experiment with the appropriation of both manmade cultural heritage artifacts and digitized natural elements encountered in museum collections. The artistic experimentation will follow a practice-based, collaborative bottom-up approach, by conducting small scale artistic experiments and selecting the results that best align with the concept and the aesthetics of the project.

The concept served as a starting point for envisioning the design and composition of the 3D virtual environment. It also served as a starting point for discussing the user experience and interaction affordances between visitors of the virtual environment and cultural assets. Most importantly, the concept provided a reference for subsequent content curation. To support the concept, an initial selection of cultural heritage assets was carried out. The selection process prioritized assets that were thematically aligned with the concept and that offered potential for meaningful integration into a virtual environment. This selection marked the first step toward shaping a meaningful and coherent integration of cultural content within the virtual space. The selection process will be expanded and refined, as development advances.

At the same time, the sessions highlighted a number of challenges inherent in working with diverse formats of cultural assets—ranging from 3D objects and 2D images to audio and video files. Recognizing these challenges related to the technical integration of heterogeneous formats into virtual worlds is important in informing future stages of development and ensuring that appropriate steps can be followed to address them, in collaboration with other WPs.

Initial concept (in the direction of Interactive Audiovisual Arts)

The concept provided a structured framework that could guide subsequent development phases. The initial concept that emerged from the ideation sessions is described by the following text:

The work will take a critical look at the anthropocentric worldview, which places humans at the top of a hierarchical structure in relation to non-humans. This worldview has led to the articulation of power relations based on exploitation from humans to nature, but also from humans to (less-privileged) humans. This conception of the world culminated during the Anthropocene, an epoch characterized by the profound and lasting impact of human activity on Earth's geology, ecosystems, and climate. It reflects the idea that humans have become a dominant force shaping the planet, rivaling natural processes. This approach frames nature as a backdrop to human activity, a repository of resources to fuel human needs. However, as the environmental crisis, biodiversity loss, and climate change escalate, this worldview reveals its limits.

Our work will follow a non-anthropocentric perspective that challenges this hierarchy, urging humans to see themselves not as separate from or above nature but as nodes in a vast, interdependent net of more-than-human entities. The work will incorporate reappropriated man-made cultural heritage (CH) artifacts. We will experiment with ways that these artifacts could change meanings, when viewed under different perspectives or when placed in different contexts. For instance, we will explore how cultural heritage items representing power relations in specific cultures could acquire new meanings in new settings. We will explore various ways for achieving this reframing of CH artifacts, for example through attaching different sounds, through enabling specific interaction

affordances or through changing parameters of their spatial composition and their relation to other elements of the virtual environment.

The work will also attempt to re-appropriate digitized natural elements encountered in museum collections, such as geological compounds (e.g. minerals), or geological sites, like caves. It will emphasize shifts that occur in a non-anthropocentric perspective, such as non-human conceptions of time and scale. The world operates on timescales that far exceed human time and scale, such as geological epochs and the evolution of species.

We will experiment with non-human scales and non-human conceptions of time focusing on the interconnectedness of humans with non-humans, such as the natural elements or animal species. Our work will explore and potentially will be informed by cultures that embrace this interconnectedness. Our methodological approach will follow a practice-based and bottom-up process. We will conduct small-scale experiments with various forms and media, and we will adopt the results of the experiments that best suit the overall concept and aesthetics of our project.

Some directions for artistic experimentation and investigation that we intend to pursue, will include but not be limited to the following issues:

- embedding 2D elements within 3-dimensional compositions
- composing 3D modelled and 3D scanned content into 3D assemblages
- using audio recordings (interviews, narrations, soundscapes) in an experimental and abstracted form by deconstructing the original sounds
- creating virtual space that do not necessarily simulate physical spaces
- experimenting with different scales of content and spatial compositions that do not necessarily imitate physical world conditions from a human perspective

Engagement with cultural collections

In order to facilitate the engagement with cultural collections and the conceptualization of cultural assets, the team systematically organized the selected CH assets using a collaborative online board. This process further fostered the identification of interesting and inspiring resources and thematic areas for artistic expression.

On this board the team created groups of similar assets, providing thumbnails of the assets and links to original collections for faster access. This grouping of similar assets allowed for the identification of patterns, and thematic clusters. For each group, the team defined the relevance of the assets to the initial concept and explored possibilities for re-interpretation and the articulation of new narratives around the assets. This task aimed to view cultural heritage materials not only as objects of preservation but also as sources of contemporary meaning and inspiration. The team created several categories of assets, such as the following: Natural Elements Minerals, Human Body, CH objects from Africa/ Masks, Contemporary daily life, Posters, Artworks, and more.

For instance, assets belonging to the 'CH objects from Africa/ Masks' group can be used as portals or gates that change the perspective of the visitor inside the virtual environment. They align with the concept of non-anthropocentric perspective as they represent hybrid creatures in between humans and animals.

In a more practical level, the team researched ways of incorporating the assets in virtual environments and possible interaction affordances between the assets and the visitor of the VEs, recognizing the importance of creating engaging and meaningful ways for audiences to engage with cultural heritage in virtual spaces. The team also identified format-related challenges and possible required modifications or conversions to ensure compatibility with the IMPULSE VR platform. Another important part of this process was the identification of interconnections and links between different groups of assets. The creation of a web of relationships between groups can potentially support coherent narratives and enrich the user experience of the VEs.

An important consideration of our team was to research content from various archive holders, and as many collections as possible. We consider that this multiplicity of perspectives provided by content coming from different cultures, eras and disciplines will bring new insights and inspiration to the project. Another consideration was to engage with different formats of CH content. The initial content selection comprised 3D models, audio files, 2D images, and video files. Integrating all these diverse formats into virtual environments can be challenging. However, it encourages creative experimentation into possible ways of integrating these assets into virtual environments, which may result in useful recommendations on these issues. For instance, 2D images can be used in virtual environments as textures on 2D plains, or they can be used as a basis for the generation of 3D models using AI technics. Audio files of interviews can be used either as soundscapes, or as text elements inside the VEs in their original language or translated. 3D models may need conversion to another format, translation of anchor point or modification of resolution.

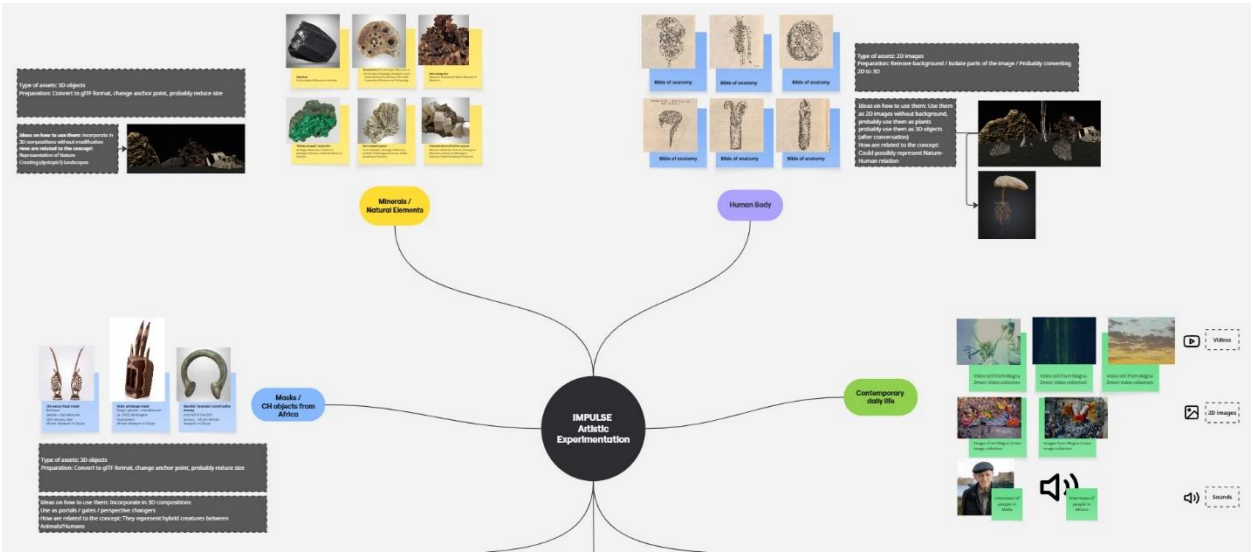


Figure 1. Part of the collaborative ideation and conceptualization board

Co-creation

During the co-creation sessions, the team collaboratively experimented with the co-creation of spatial compositions and assemblages of 2D and 3D cultural artefacts. A central component of these sessions was the use of the IMPULSE multiuser virtual reality platform developed in WP2, which enabled participants to collaborate in a shared online virtual environment. Within this space, participants engaged in joint exploration and artistic experimentation, fostering a sense of co-presence and collective engagement with cultural content. The platform offers a set of tools which enables participants to import cultural heritage assets in a virtual environment and to collaboratively create small-scale compositions incorporating the selected CH items. These compositions served as experimental pilot prototypes through which participants explored alternative interpretations and developed new narrative possibilities around heritage content. This hands-on practice encouraged participants to move beyond conventional uses of cultural material and to consider novel ways of combining and contextualizing heritage assets. Moreover, a series of small-scale artistic experiments was conducted offline, using 3D modelling tools, such as Blender and VR Game engines, such as Unity 3D.

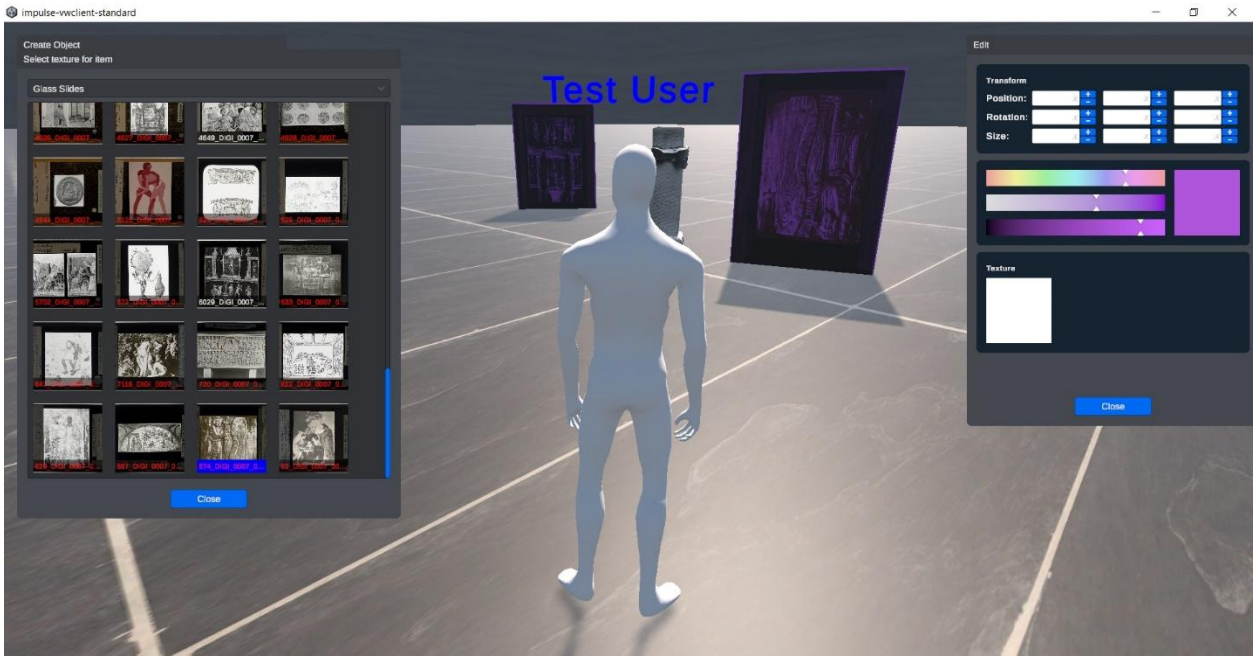


Figure 2. IMPULSE multiuser virtual reality platform

In parallel, participants made use of the web client, developed in WP2, as a complementary tool for browsing and selecting content. The web client allowed the team to easily access the available cultural heritage assets and consider them for inclusion in the creative work. The process of selection included discussions on the relevance, potential meaning, and aesthetic qualities of the resources in relation to the initial concept of the project.

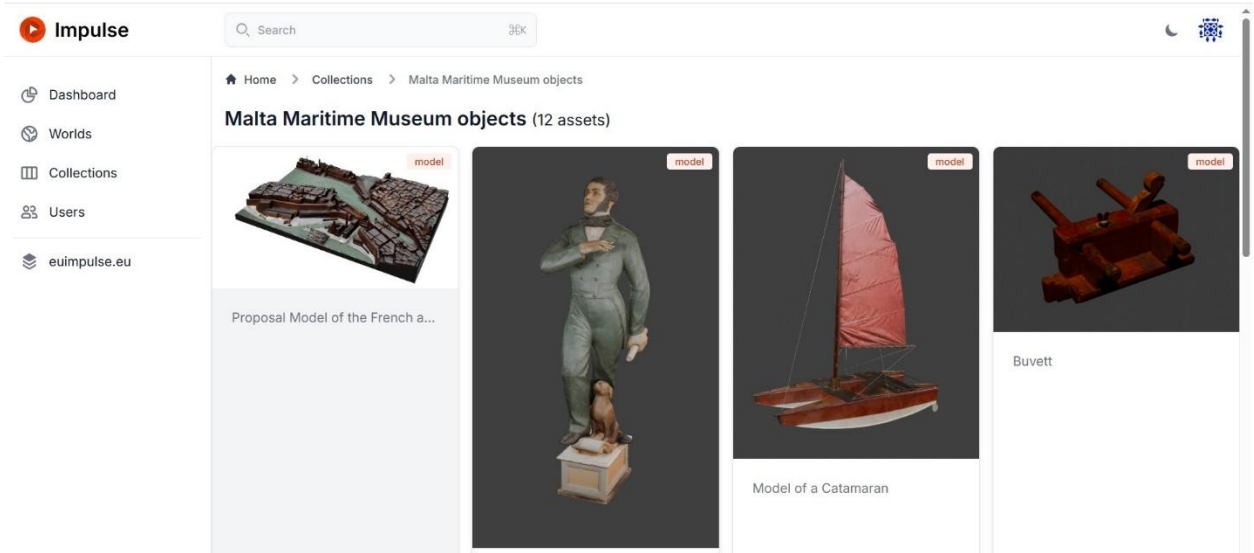


Figure 3. Browsing content via the IMPULSE web client

Finally, throughout the co-creation activities, participants actively identified and highlighted inspiring resources that aligned with the concept and the thematic areas defined during the preceding ideation sessions. This process of alignment ensured continuity between the ideation and co-creation phases, while also reinforcing the shared vision that guides the team's work.

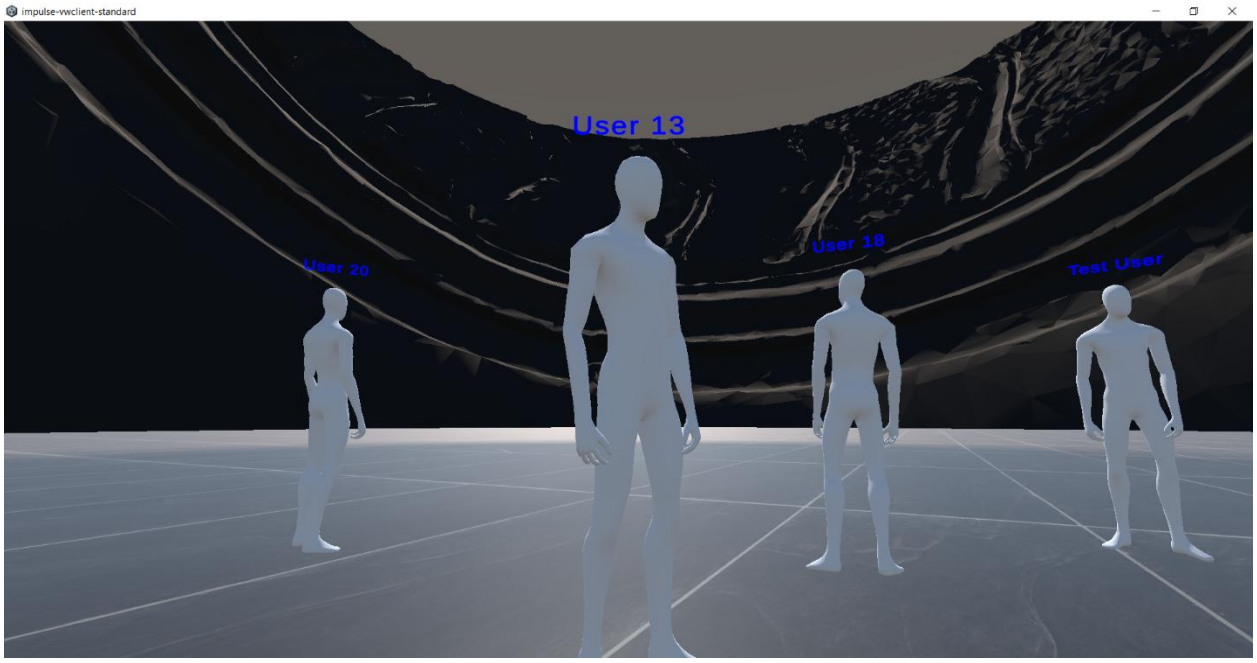


Figure 4. Co creation sessions inside the IMPULSE multiuser virtual reality platform

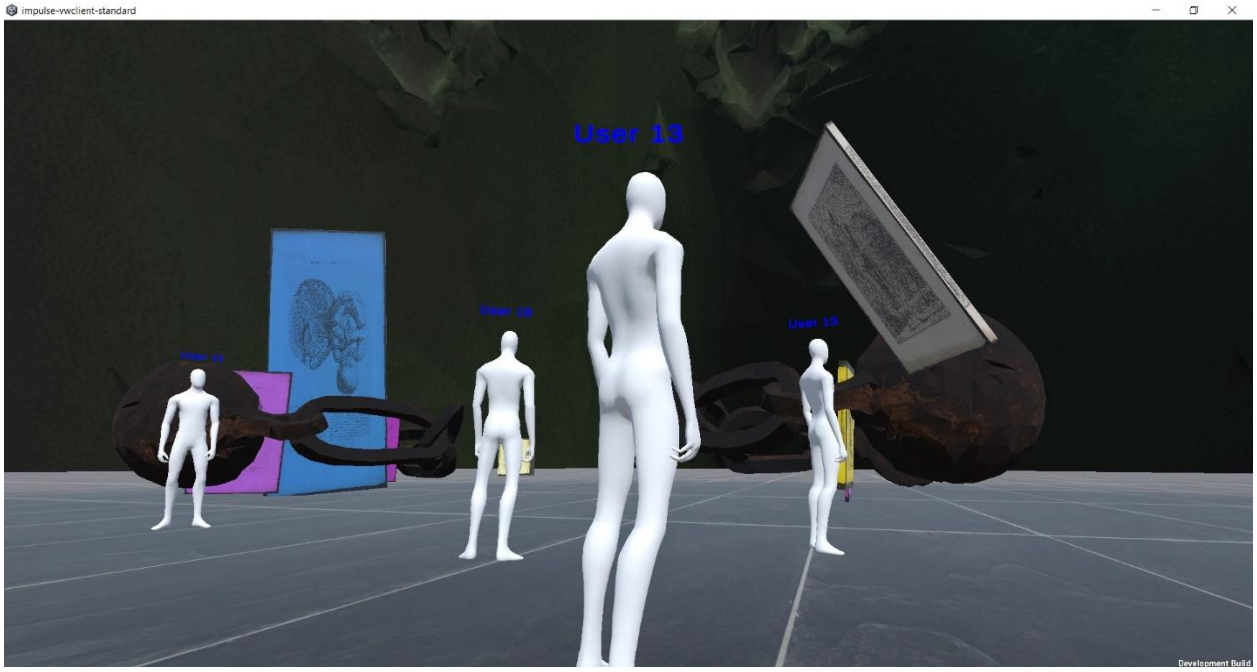


Figure 5. Co creation sessions inside the IMPULSE multiuser virtual reality platform

IMPULSE WP1.2 - ARTISTIC EXPERIMENTATION

INTERACTIVE ARTS PROTOTYPE - CONCEPT

The work will take a critical look at the anthropocentric worldview, which places humans at the top of a hierarchical structure in relation to non-humans. This worldview has led to the articulation of power relations based on exploitation from humans to nature, but also from humans to (less-privileged) humans. This conception of the world culminated during the Anthropocene (Wagner and Wieland 2022), an epoch characterized by the profound and lasting impact of human activity on Earth's geology, ecosystems, and climate. It reflects the idea that humans have become a dominant force shaping the planet, rivaling natural processes. This approach frames nature as a backdrop to human activity, a repository of resources to fuel human needs. However, as the environmental crisis, biodiversity loss, and climate change escalate, this worldview reveals its limits.

Our work will follow a non-anthropocentric perspective that challenges this hierarchy, urging humans to see themselves not as separate from or above nature but as nodes in a vast, interdependent net of more-than-human entities. The work will incorporate reappropriated man-made cultural heritage (CH) artifacts. We will experiment with ways that these artifacts could change meanings, when viewed under different perspectives or when placed in different contexts. For instance, we will explore how cultural heritage items representing power relations in specific cultures could acquire new meanings in new settings. We will explore various ways for achieving this reframing of CH artifacts, for example through attaching different sounds, through enabling specific interaction affordances or through changing parameters of their spatial composition and their relation to other elements of the virtual environment.

The work will also attempt to re-appropriate digitized natural elements encountered in museum collections, such as geological compounds (e.g. minerals), or geological sites, like caves. It will emphasize shifts that occur in a non-anthropocentric perspective, such as non-human conceptions of time and scale. The world operates on timescales that far exceed human time and scale, such as geological epochs and the evolution of species.

We will experiment with non-human scales and non-human conceptions of time focusing on the interconnectedness of humans with non-humans, such as the natural elements or animal species. Our work will explore and potentially will be informed by cultures that embrace this interconnectedness. Our methodological approach will follow a practice-based and bottom-up process. We will conduct small-scale experiments with various forms and media, and we will adopt the results of the experiments that best suit the overall concept and aesthetics of our project.

Some directions for artistic experimentation and investigation that we intend to pursue, will include but not be limited to the following issues:

- embedding 2D elements within 3-dimensional compositions
- composing 3D modelled and 3D scanned content into 3D assemblages
- using audio recordings (interviews, narrations, soundscapes) in an experimental and abstracted form by deconstructing the original sounds
- creating virtual space that do not necessarily simulate physical spaces
- experimenting with different scales of content and spatial compositions that do not necessarily imitate physical world conditions from a human perspective

Deliverable 1.5 performing heritage report

 # Piloting workshop 1 at Gozo

First piloting workshop at Gozo (De Soldanis 1999) took place between 12. and 16. of May where Paula Guzzanti and Luka Prinčič were working off-line (IRL - "in real life") to establish vocabulary and conceptual framework, engage with technologies available and get pilot up and running in terms of better understanding the process of creation.

As the workshop kicked off it was important to establish good understanding of the structure of the whole IMPULSE project and how does the 'performing heritage' pilot fit in the bigger perspective, in both conceptual and practical terms: most importantly what are the immediate neighbouring co-creators: both in the performance team, as well as in interactive art stream, WP1.1 and WP1.3.

The work proceeded with number of conceptual propositions such as liminality, liminoid spaces, archeoacoustics, heterotopias, non-places, queering (Ceuterick 2021) the heritage, speculative (science) fiction, and solarpunk. The format was informal and creative, with discussion ensuing often, which provided a good way to establish common grounds in regards to expecations, desires, and artistic research interests. In particular, number of artistic research methodologies were proposed, e.g. recording voice notes. This dialogue between participants proved to be an important grounding factor in an effort to start working together. A common online data repository was agreed upon. Workshop continued to research sound possibilities - both aesthetically, its practical applications in a performance, and technologically. Participants visited Ggantija temple and site of Sansuna's Rock on Gozo.

Technological solutions were explored, in particular free/libre open source solution called Freemocap, a proprietary system "Perception Neuron 3" with Axis Studio software on Windows, and PICO XR headsets. Realtime motion capture with Perception Neuron 3 needed unexpected amount of time to find a particular setting in calibration so that it worked really well, but unfortunately only at the end of the workshop.

In summary, the workshop helped to make good progress in establishing process for choreography in the performance, including methodologies of artistic research. It also uncovered technological particulars in systems that we will continue to work with. Last but not least, spending informal time together in so-called "meat-space" can (and did) establish a solid ground for team work. Especially if cooking for the team is involved.

 # Piloting workshop 2 at Gozo

Second workshop took place in 5 days during two weeks at the end of July 2025. Participants were Luka Prinčič and Paula Guzzanti, with some assistance from Adnan Hadziselimovic. During this workshop a good base created in first workshop served as a quick jumping point into research of various archeological and anthropological fragments regarding Maltese neolitic history and heritage, specifically Gozitan sites and myths. A mix of information was considered, being both careful and inspired by scientific archeological publications, antropological research, and myth-making through folkloric imaginary.

Through research two interesting - "fringe" - archological sites on Gozo were discovered as inspirational points of artistic work: Ta'Marziena and Taċ-Ċawla. The former being a neolitic temple which wasn't a focus of "offical" archeological research. Combining various imaginary and factual points this site served as an important inspiration towards creating fictional fragments (Reichardt 1978) and even story arcs which included writing music, a song sung by an opera singer, various non-human characters (e.g. a temple as a character in dialogue with a bird), and contemporary environmental issues (e.g.: hunting of migratory birds). This provided fertile ground to produce textual, photographic, and even 360 video footage - which will serve as a potent material to be returned to and used later in the process.

The site of Taċ-Ċawla - an excavation area that was overrun by development and apart from numerous artefacts taken to main Malta museum only two bigger megaliths were left at the crossing beside a bus stop - served as an interesting fictional meaning-making across time, combining myth-story of Gozitan giantess of Sansuna, sleeping lady (most famous Maltese neolitic figurine), and megaliths, all meeting on a bus stop in 21st centuryt. Here we performed a movement improvisation, research including fully mobile battery-powered realtime motion capture of the performer.

All these experiments in tangible meaning-making using available technology already represent a running pilot project which will continue to serve as both methodological and practical framework to continue research of performing, creating, remixing, and queering the heritage within virtual environments.

IMPULSE WP1.2 PERFORMANCE STREAM PROTOTYPE PILOT CONCEPT

Theoretical basis of this (otherwise fairly practical) work includes **critical theory of technology**, the goal of which is an exposure and reveal of inner workings of digital technology, technical ones but more importantly also ideaological ones, especially power relations and imbalances. This line of thought naturally connects to the need to prefer libre open source software, open hardware, and strongly influences the aesthetics of visual language. The latter can in effect lean into **aesthetics of digital glitch**,[1] avoiding smooth opaque surfaces, searching for fractures in objects and interfaces. In fact, **errors** are celebrated in the contemporary **livecoding** communities, where performing live programming of sound and visuals always includes projection of performer's computer screen. The source code that creates our sensorial environment is thus transparently revealed. Such explicitness is a manifestation of **seizing of means of production**. This emancipation and agency quite inevitably leads us to questioning of established regimes of power, of patriarchal dominance, and therefore exploring **intersectional posthuman trans-feminism[2] and decolonial theory and practice**.[3] The gender binary is deeply ingrained in western racism and construction of whiteness, so the project would benefit from **queering of cultural memory** and heritage by using post-cinematic technologies. It will benefit from speculative fabulation and sym-poiesis (making-with)[4] of science fiction. D.Haraway's concept inspires the idea of intertwinement of many human and non-human organisms to collectively contribute to the functioning and resilience of an ecosystem as a whole.

Therefore, substance that can serve as a starting point of creative process is the creation of **stories**. These are influenced by number of concrete neural points as potent inspiration: megalitic temples of Malta (Debertolis, Coimbra, and Eneix 2015; Eneix 2014), specifically **Ġgantija** would serve as central site of meeting of **shaman-witch-giantess** and a perfomer whose movements are captured in real-time and transcoded into sound and avatar construction in augmented reality. **Shaman's figurines** and **sleeping beauty** serve as just some of the techno-objects of mythmaking in a blur of real and virtual. **Mnajdra solar temple** is an astronomic technology hiding special powers while necropolis **Ħal Saflieni** offers a theory of sonic transportation through sound: 110/114Hz drone as a portal to a different space-time. Fabulation can offer a grand escape of the civilisation and explain the **dissapearance of temple culture**[5] from Malta by the end of neolitic period. Transcoding the notion of a witch into contemporary times: "**the witch hunt** stands at a crossroad of a cluster of social processes that paved the way for the rise of **the modern capitalist world**" writes Silvia Federici. And furthermore in the quest of futuristic speculative fabulations: while **cyberpunk** established critique of capitalism through dystopian science fiction, recent rise of **solarpunk (Reina-Rozo 2021)** perhaps echoes the words of Ursula K LeGuin: we need artists who "can see

alternatives to how we live now and can see through our fear-stricken society and its obsessive technologies to other ways of Being, and even imagine some real grounds for **hope**."[6]

An over-arching technological principle governing creation of this performance is using **libre open source software** as much as feasibly possible. To capture movement of performers - both to record and in real-time - we plan to use **freeMOCAP**, **Blender** for 3D art modeling and rendering to video, **Godot** game engine for creation of virtual worlds with objects and avatars to be used in real-time, **three.js** for an intermediate experimentation. We will explore livecoding of 3D assets and worlds in **Processing** and **P5live** and livecoding music in **SuperCollider**. Current technologies for augmented and virtual reality are headsets **Hololens** and **PICO**, but as this is fast moving field, we'll explore some of the most current **augmented reality hardware in 2025**. For some viewers, extended reality performance would be available via tablets and phones. We'll explore technological challenges to connect **to virtual worlds on the IMPULSE online platform**.

It seems important to establish a specific continuous activity throughout the creative process: **documentation practice in the form of textual and video notes**, which might be important at the very end of the project. Early phases of creation involve **reading, writing, exchange of stories, and dialogues** between all creators: sound artist, performer, 3d artist, and programmer. We'll be **collecting** images, sounds and 3D models, **drafting scenes** (objects/spaces) in 3D and VR. There is a desire to stay open for deeper **research of glitches, disruptions, distortions, and displacements** in the multidimensional presentational space and time: dots, vertices, wireframes, polygons in Blender and Godot, creating both 3D assets and rendering videos. We'll be writing **snippets of code for livecoding** in Processing, P5live, ThreeJS, and SuperCollider. Livecoding rehearsals will be combined with freeMOCAP and AR/VR **headsets movement research** with performers. An important aspect is live performance research of **interoperability** between software environments Godot, SuperCollider, and P5live.

We envisage **possible timelines & formats**:

1. an augmented reality **performance in front of Ġgantija temple** with a motion-tracked performer and animated/rendered giant pan-gender shaman-witch in VR - with music composition and reactive sound in headphones (or PA), percieved via tablets and headsets for a select audience - documented on video - performed/created in first half of 2026

2. **documentation collection** in video, audio, image, and text formats produced during whole research process, briefly analysed in the last month of IMPULSE in process of writing report/recommendation
3. final **performance-presentation** with video projection and sound/music in December 2026 using movement materials from Ġgantija performance, video materials from documentation, and live XR fragments

1) https://en.wikipedia.org/wiki/Glitch_art
2) https://en.wikipedia.org/wiki/Rosi_Braidotti
3) https://en.wikipedia.org/wiki/Decoloniality
4) https://thisvsthat.io/symbiosis-vs-sympoiesis
5) https://www.maltatoday.com.mt/arts/architecture/47313/the_death_of_the_temple_people
6) https://www.americanrhetoric.com/speeches/ursulakleguinnationalbookawardspeech.htm

Deliverable 1.5 report for Teaching & Learning

Workshops run by: Aphrodite Andreou, Andrew Pace, Margerita Pulè, Kris Polidano

Dates: 3pm – 5pm Saturday 26 July 2025 & 5pm – 7pm Monday 28 July 2025

Venue: Unfinished Art Space Studio, 203 Old Bakery St, Valletta

Title: IMPULSE Virtual World; using digitised historical artefacts to translate game dynamics into virtual environments

Participants: Mainly students in digital art, digital games, academics at UM, visual artists working at intersection between analogue and digital media, artists working with archival or historical material, experts in digital exhibition-making.

Datasets presented: Heritage Malta Oral Histories collection, Magna Żmien Film video collection linked with prehistoric sites, KU Leuven Glass Slide collection linked with ancient sites, FBKW interview clips, Jagellonian collection of Navigation Instruments, Thessaloniki Film Festival collection of posters

Research questions:

What are the interesting and creative restrictions that we can encounter, and how would restrictions influence storytelling and agency within the virtual environment?

How do aesthetics influence storytelling and world-building within a virtual environment?

How can we design non-linear, layered, and multi-sensory narratives, where audiences become co-authors?

What should be augmented when representing a cultural heritage asset (tangible or intangible) in a virtual environment? (the object, the connection, or a speculative story)

What level of agency should be granted to the virtual visitor?

How can a virtual space be successfully curated using meaningful game mechanics?

How do we experience the same story across different mediums, and what is gained or lost in translation?

What is the role of movement, spatial navigation, and social interaction in shaping audience experience?

What can virtual environments offer that physical spaces cannot, what are the unique affordances of the digital realm?

Documentation
Images saved here

Feedback and Findings

The feedback provided by participants has been grouped below in relation to certain subjects which repeatedly surfaced in reaction to the collections and the research questions presented.

Access, Accessibility & Agency

A virtual world can allow increased accessibility to sites that may be closed to the public. Some heritage sites were more physically accessible a few decades ago than they are to today's publics; digital access can counterbalance this.

When the material is familiar to users, it changes the relationship with the digital version; easier access could be allowed, or viewpoints can be changed.

Older users should be allowed equal access to digital environments. Open access online, as well as ease of accessibility (i.e. easy to find and enter) would make this more beneficial.

Information should also be easily accessible, e.g. when objects are being interacted with – the relevant information should be easy to find.

Limits & Boundaries

Sometimes placing limitations on a user's agency can be a positive - both in terms of the user experience, and in terms of the educational aspect (e.g. limiting the amount of information presented).

Boundaries can be placed on users, just as boundaries are placed on visitors in the real world. OR boundaries can be abandoned altogether, and full access can be allowed.

Artistic interpretation or manipulation of artefacts within a digital platform can enhance a collaborate experience; boundaries can sometimes present a positive challenge to creativity.

Affect & the User's Experience

Sound, and a story, can allow a user to visualise it, without the need for visual imagery.

Sound can contribute to a sense of space within the virtual world.

The ambience and the aesthetics of the environment are more important than accurate information. 3d scans can sometimes be so accurate that they lose some aesthetic value and provide 'only' digital information.

Some interactions can be activity-based, but others can benefit from being similar to durational art works, allowing users to explore at will, rather than being asked to complete a task.

A world could be created in slow-motion, intended to continue for 20 years, similar to heritage traditions that renew buildings every 20 years, thus embedding the essence of heritage in the worlds make-up and integral design.

Viewpoints could also include keyholes, or a restricted view to increase mystery in a world. Different user viewpoints could provide excitement and interest within the virtual world.

Atmosphere, Sound & Spoken Word

The musicality of spoken word, and the emotional quality can be a strong contribution.

Although language may not be understandable (in a different language), it still presents an atmosphere and a meaning through its tone and emotion.

The voice recordings show a certain emotion that is not always present in a posed photo.

Materiality & Disintegration

The materiality and the fragile nature of many of the artefacts can provide an engaging inspiration and a source of activities for users.

Disintegration of artefacts in a digital environment can also be engaging.

When faced with disintegration, users may just try to save, recreate, or reimagine the artefact.

Damage or vandalism to artefacts can be reversed online but can also be deliberately incurred.

Power Dynamics within Collections

Individuals in many images are not identified; they are recorded as 'natives' or 'workers'; in a virtual world, colonial practices like this dehumanisation, should be addressed.

Without addressing colonial dehumanisation, there is the risk that these attitudes will be repeated or strengthened by their repetition.

Historical material that depicts problematic material (eg racist, sexist) should be approached with caution; thought needs to be put into it - should it be shown at all, should it be accompanied by an updating note?

Problematic content should be approached with caution. Erasing material (or not making it accessible) is a form of repeating of colonisation, in again, hiding or controling information linked with a colonised culture.

Some archival images show problematic positioning of - for example - the photographer, or the colonial power recording ancient sites.

There is a tension between the strong images in the Thessaloniki collection, and the dated, quite sexist nature of their content.

Alternative Histories & Diversity

Some content presented shows historical information from an alternative perspective; a digital platform can strengthen the diversity of voices in historical contexts.

A broad range of archival material can allow for diversity of voices and a more interesting endpoint.

Depending on the content, some humour can also be engaging (e.g. in the material in amateur film).

Fiction is also present in 'historical artefacts' - e.g. in imagery, film content or sound recordings

Depending on the content, some can show insights of personal life, and can show aspects of historical ways of recording material (e.g. in amateur film)

Personal stories are brought to the fore in some material

People's stories and information that is not fully presented can spark imagination and speculation.

Some of the material shows stories and experiences, and presents a life and an atmosphere, rather than factual information; this can be recreated in a virtual environment.

Community and Creativity

Some of the artefacts can be manipulated collaboratively, e.g. painted on.

A virtual world allows for collaborative projects with individual agency (e.g. individuals choosing a pixel's colour and contributing to one, large, digital artwork).

Open source and open access allow for greater agency and a stronger sense of community.

Co-creation can foster a community atmosphere and increase feelings of ownership of the platform

Reference is made to the Palmyra Project that crowd-sourced images and knowledge of destroyed Palmyra sites, in order to reconstruct a digital version of historical artefacts.

Decontextualising artefacts within the platform could allow for increased creativity and experience.

Community & Collaborative Space

The platform should go beyond simple representation, and move towards adaptation, interpretation and creation.

Co-creation can foster a community atmosphere and increase feelings of ownership of the platform

Collaborative narrative-building may be a positive community-building strategy.

The virtual space allows for collaborative activities, e.g. building a ship together, or creating imaginary spaces in which users can move around and co-exist.

The virtual space allows for collaborative activities, e.g. building a ship together, or creating imaginary spaces in which users can move around and co-exist.

The emptiness of the virtual platform, with no colliders, and no walls, provided an aesthetic pleasure to the user.

Some material that is familiar to users, and that shows familiar scenes may allow for a greater sense of ownership of the platform.

Creating connections between artefacts themselves can provide additional context within the platform.

The relationship between the historical material and the present day is something that should be carefully navigated within this process.

Speculation and Storytelling

Speculation and imagination can be a fun and engaging activity for users, which in turn can provide a strong educational experience.

There may be a contradiction between the educational aims of the project, and the speculative nature of the creative process.

Storytelling should be a strong part of the process; it would strengthen the experience and make for a more educational result.

Some of the artefacts relate specifically to scientific breakthroughs of their time (e.g. navigational instruments) - this can be translated into a user's experience and the science fiction of their time.

The context of an object or artefact assigns it its value; seeing it in a museum context assigns it a particular meaning.

The tension between creativity and historical truth is present, depending on the ultimate aim of a digital platform.

Curiosity can be a strong driver in engagement and education.

Re-purposing, re-using, re-designing and re-creating existing assets could be an exciting and engaging activity for users, leading to increased education.

WP1.3 Exhibition as playground

This research and proposal is mainly based around artefacts and story-telling at the Maritime Museum in Birgu, Malta (Heritage Malta). The collection holds a large number of tools, maritime instruments, records and archival material, as well as other artefacts

relating to the maritime history of the islands. This collection is proposed by Heritage Malta for practical reasons, namely its accessibility for digitisation.

Some of the artefacts at the Maritime Museum










The proposal also considers one dataset from Magna Żmien, that is, a collection of still and moving images relating to prehistoric sites in Malta. The consist mainly of what seem to be family outings to prehistoric sites, before access became more restricted, with children clambering over rocks and structures. The films also contain scenes from other family outings (eg to Valletta). One film in particular shows what appears to be a short fiction film about the finding of an Egyptian artefact in one of the prehistoric sites.

Images from Magna Żmien Collection

Teaching and Learning Prototypes

This research is based on Task 1.3 of WP1: Teaching and Learning Prototypes

This task explores how to engage teachers/students with digital cultural heritage collections/curators in such a way that the learning experience is reciprocal. The key to this is a data-driven yet human-centred approach that intensifies interaction to the level of co-creation. The partners in this task will build upon the results of the user survey in Task 1.1 and ideation from Task 1.2 to develop a methodology for engagement that focuses on collection interpretation by sharing and co-creating contextual layers around objects included in the Metaverse (Lee et al. 2021). Collaborative interpretation models employing novel, suitable discovery aids (the desktop and VR interfaces developed under WP2) will be developed on the basis of a use case that allows for replication and extrapolation in different settings and (upscaled/downscaled) dimensions. By making interpretation, contextualization and teaching/learning processes incremental and reciprocal, the target audiences/end users become the pivot of the heritage experience jointly with the collection holders.

Guided by a methodology designed to include use scenarios and interpretation models, this task will also produce a playbook for community interaction building on insights and experiences gathered through the teaching/learning use case. Both methodology and playbook will be piloted in a series of practical workshops with the targeted end users exploring how less-visible collections and sources of knowledge can be creatively engaged with. The outcomes of the workshops will be key to shaping, operating and populating inclusive and purpose-focused metaverses that translate user needs and requirements into a digital environment that allows countering of traditional, hegemonic top-down approaches to digitisation.

The project aims to create a prototype for reciprocal learning by focusing on university teachers/students and their historical pedagogical processes. Through hands-on activities and workshops, they will explore diverse heritage collections, reflect on historical teaching practices, and redefine the ownership of collections and narratives. This approach blurs the distinction between teacher and student, allowing both to have a hand in storytelling and interpretation, and redistributes the inherent power relationships of knowledge-sharing in institutions. The project also questions the nature of co-creation and co-curation and seeks to move toward more equitable community- level engagement.

The results of this task will be threefold:

- a validated use case for student/teacher engagement in historical subject matter will be available for replication and further development;

- a methodology, a playbook and guidelines on how to use them will inform a wider circle of stakeholders, including GLAMs, on how to facilitate and deploy innovative user engagement scenarios;
- the Multi User Virtual Environments created for this purpose will be developed around and populated by objects from a selection of archive materials supplied by the partners, in collaboration with the pilot audience.

Proposed Teaching and Learning

The 'teaching and learning' proposed here will focus on the exploration of contemporary curatorial methodologies, in particular alongside and including heritage collections and archival material.

Contemporary curatorial methodologies encompass a range of approaches within contemporary art which focus on connections created during the exploration, research and collaboration phases of a project or exhibition, in particular connections and negotiations between participants, audiences, artworks, narratives and sites.

More recently, curation has embraced Nicolas Bourriaud's definition of relational aesthetics, but have also moved beyond this to an experiential model emphasising interactivitiy, or in other cases, proximity. Contextuality is now a central element, with curatoiral projects situated within specific social, political, and historical contexts.Interdicsiplinarity has also become more important, as has a much broader definition of art-making and exhibition-making, which now also include activities such as cooking, debate, walking, or singing.

Theories of "the curatorial" (Maria Lind): 'the curatorial' as distinct from 'curating', ie the work of drawing connections among and between people, objects and ideas – how can this be translated into curating historical artefacts?

Contemporary curatorial methodologies can also take into account contemporary museum curation approaches such as James Clifford's 'contact zones' referring to the space of colonial encounters. Recent research around museums has also acknowledged the 'conflict zones' which they contain, in particular when holding looted colonial (Bastian 2006) material (here), but also when embodying misplaced funding sources (Sackler) or gentrification within urban communities.

Teaching and Learning contemporary curatorial methodologies

I am proposing this as a central teaching and learning goal, in part to provide a more focused aim to the task, while allowing for flexibility of approach. Since the 'curatorial' as defined above, centres around drawing connections – it can allow for the collaborative and co-creation approach adopted by this task.

Rather than attempting to directly teach historical information, a contemporary curatorial methodology can provide for a more open route to knowledge, considering diverse approaches such as peripheral thinking, radical empathy (Misselhorn 2009), decolonial perspectives, counter-narratives, and investigative methodologies.

Using contemporary curatorial methodologies will not lead to a rejection of the information embedded within each artefact or dataset and will not reject verified facts or histories. But it will allow for a certain flexibility in approach that may otherwise be restricted.

And so, I am hoping that it will lead to a deeper understanding of the many layers and contexts embedded within the datasets, rather than an increase in empirical knowledge.

Flexibility and the playground

This need for flexibility within the curatorial process has led us through a number of ideas, including that of the 'Wunderkammer', worldmaking, and detective role-play. However, the concept of 'exhibition as playground' allows us a level of exploration, conceptualisation, learning and co-creation, that can allow for the collaboration required in this task, while also providing space for historical information to play a significant role in narrative-building.

The 'exhibition as playground' metaphor allows for the creation of a space for exploration, which depending on participants' needs (and how our ideas develop), can lead to the creation of a wonderland within an exhibition, or can be more restrained, with simple yet significant links between artefacts.

Drawing inspiration from fantasy scenarios and the notion of free play, would allow us to expand traditional curatorial approaches, reimagine how artefacts are presented within a museum context, and explore the role of the museum space.

Importantly, it would also allow us to experiment with the agency of the artefacts themselves, exploring the possibility of objects possessing their own inherent meanings, independent of historical or scholarly frameworks.

'Exhibition as playground' can also be read as a political space, providing flexibility to overturn traditional hierarchies (literally on their heads), as objects and artefacts are understood in isolation, rather than within power structures they may traditionally have been linked with.

Spatial journeys

Maritime Museum collection includes a number of navigational tools spanning centuries, if not millennia, and ranging from rudimentary stone to highly sophisticated precision instruments. This idea of movement and navigation within a space also relates to 'museum as playground'; these tools can be used to build a narrative or direction during co-creation. It can also allow participants to intentionally work from peripheries rather than from central narratives.

Points of enquiry

How can the range of skills and activities usually contained within the curatorial – people skills, management, research and theory, writing, spatial thinking, communicating, and more – that is usually part of the process of negotiation and pushing-and-pulling

of the curatorial process, come into play in this context? I would like to explore the tension that exists between contemporary and heritage curators in approaching the curatorial process and provide some useful insight into this area. I would also like to acknowledge the challenges & paradoxes facing museum curation as museums are under ever-more pressure to be more engaging and fun, while remaining educational.

Where and what – in physical, metaphorical, political space – is the exhibition space? I would like to imagine the museum space reinvented as a space for dialogue and dialectical thinking, including concepts of doubt, unknowing, and unlearning (Azoulay 2019) into the conversation. I would also like to explore the notion of the exhibition space as expanded space, where objects can exist without a context or without a history themselves - a sort of 'reinventing' of the objects.

Can we engage elements of chance, or juxtaposition to create intended or accidental meaning? I would like to explore the metaphor of 'exhibition as a playground' where experiments in juxtaposition, cut-out, collage and reinvention can take place in an environment of co-creation.

Can objects exist without a history? I would like to think about the possibilities embedded within giving objects their own agency and meaning, apart from that which is endowed upon them by history and formal knowledge.

(How) can a dramaturgy be formed through this process? Can navigational tools from history be used as narrative-forming tools in an exhibition environment?

Can we play? I would like to investigate how far participants and audiences can be pushed to play with artefacts and histories, and if this is helpful in their understanding of the relationships between the objects themselves.

Way Forward

To explore methodologies alongside possibilities – a conversation in the coming weeks or in Leuven?

To agree on participatory methodologies, alongside technical possibilities – what is realistic in terms of interactivity

To negotiate what is available in terms of sound, movement within the exhibition space

To select artefacts through conversation with Heritage Malta and Magna Żmien, and to explore possibilities of digitising contemporary objects

To develop a more concrete visual 'existence' of the exhibition as playground

Feedback from Pre-hackathon Session, 18, 19 February 2025

Ancient Places, Living Heritage

Introduction

Ancient Places, Living Heritage

Artefacts: Glass slides of ancient sites, including Palmyra and Baalbek held by KU Leuven Libraries.

Keywords: ancient ruins, temple floor plans, archaeological excavation, mystical architecture, columns, lost civilization, speculative history, rituals, daily life, reconstructions

The interesting element of this group was the fact that the 'artefacts' themselves were slides which contained diverse images; so the first question faced by the group was which artefact characteristic to focus on; the ***slides*** or the ***ancient sites***?

In general, the group went for a combination of both content forms, using the ancient sites to form their narrative and aesthetic, while incorporating the characteristics of the slides into general ideas and activities.

Story-building process

Before beginning work on their narrative, the group took some time to think about the purpose of storytelling, the story-arc in narrative threads, and the impact that story telling can have.

The group was divided into two, in order to brainstorm ideas and build narratives in smaller groups. While one group focused more on narrative ideas of traveling through different lands and geographies, the other proposed more goal-oriented ideas, such as timed tasks and competitive activities. Ultimately a balance was sought by combining the ideas of the two groups.

Proposed aim, narrative and target group

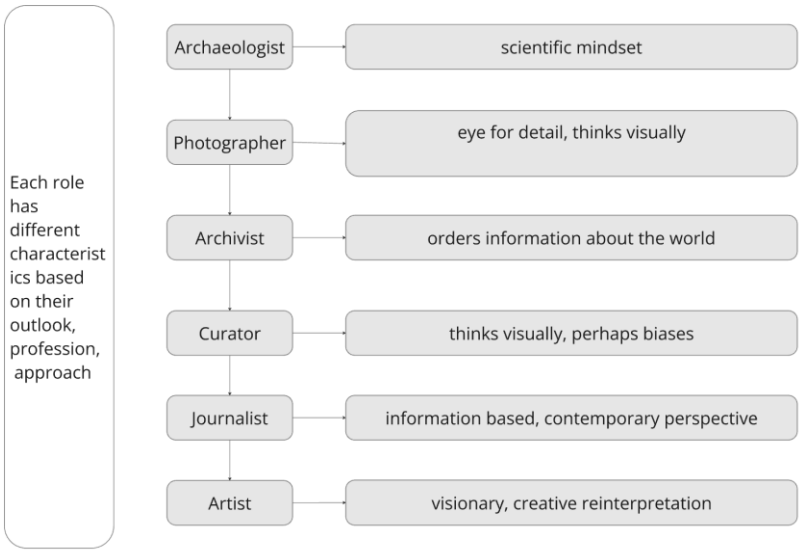
The team proposed a levels-based game with the educative purpose of allowing users to discover that historic interpretation is subjective, and that historical facts can sometimes be questioned or reinterpreted due to new discoveries or ways of thinking.

The process would be a collaborative process and world in which users can choose from a variety of roles which allow them to see different selections of slides and require different tasks to be carried out.

As the user progresses through 'levels', they will have to choose another role so that by the end of the world, they will have inhabited all roles.

The proposed target group was third-level students of political history, anthropology, humanities, and those interested in history who would like to know more about how history is reported and taught.

The group proposed roles based on professions that may interact with historical artefacts, visual material, historical information or contemporary information on a daily basis.



This selection of roles would allow a use access to a certain group of slides which would be appear large-scale, as if projected in front of them.

Depending on the user's role, they will be able to see a selection of slides. For instance, photographer role would have slides related to their outlook.

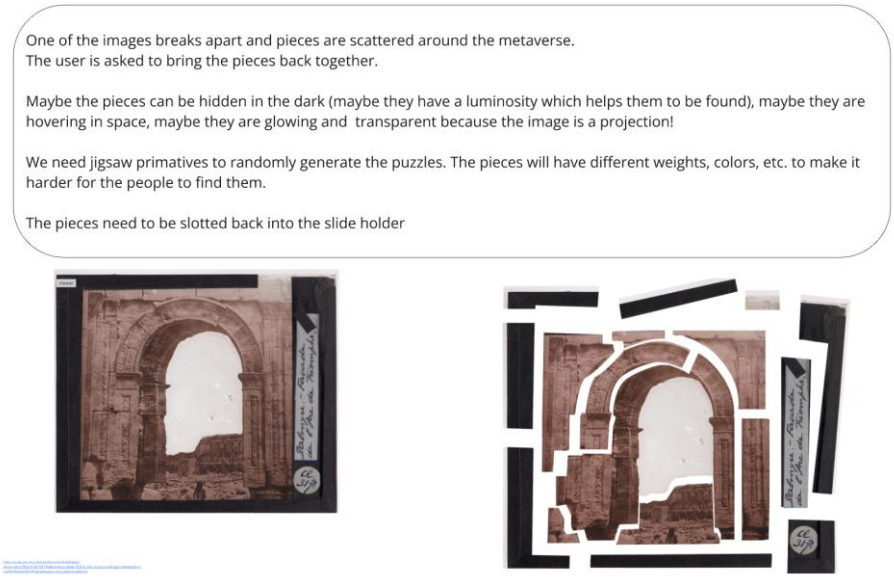
The world darkens, the slides appear projected in front of you.

You can explore the slides by walking around the images, maybe even walking through them, having them projected onto you!

Proposed Activities

Not enough time was available to drill down into the activities, in particular because consensus was not reached on the kinds of activities that the target group would enjoy.

A jigsaw-style game was proposed; for older users, this could be made more interesting and more creative through free-building with shapes, or a more interesting play with the glass slides provided.



Another proposed activity was more related to the formal task of attributing information, done by archivists, and related to matching metadata labelling on particular slides.

users are presented with a more difficult task, also linked with their role

metadata matching? Expanding the metadata?

a collaborative task with slides brings all the users together

users take parts of slides - light & colour to form a collaborative image that is projected onto the walls of the space.

There is no right or wrong in this task - users can overlay slides to form whatever structure they want

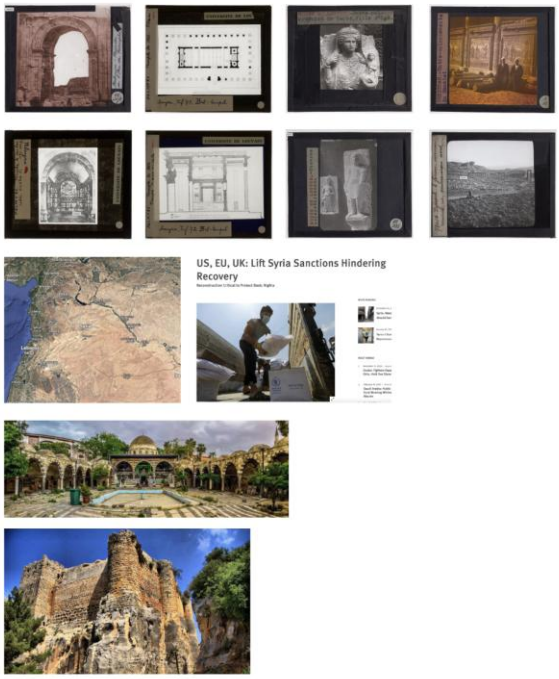
An alternative may be to be given the task of building a particular structure from the slides, but this is less open-ended.

Some activities were suggested for more sophisticated users, who could curate their own material based on their interests and could collaborate and share their collection with other users or co-create a world within a specific scenario.

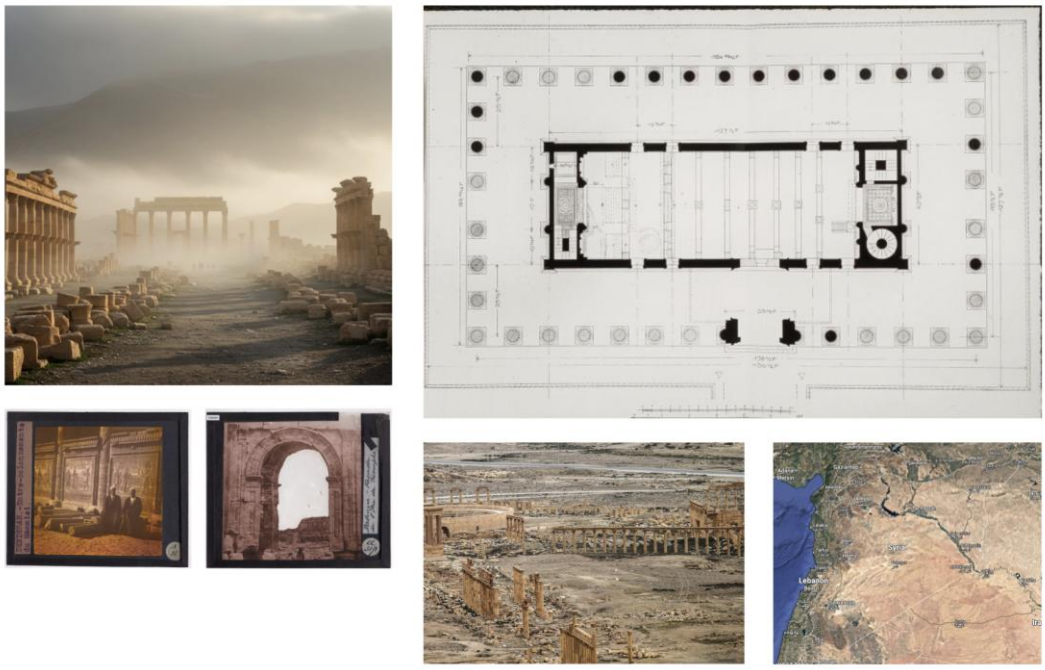
One interesting proposal was to purposely include ‘glitches’ in the material so that it behaves in unexpected ways, giving users additional and unforseen challenges in their activities.

Visual and Physical Characteristics

The team proposed a ‘mood-board’ inspired by the ancient sites. A circular or ‘spiral’ framework was imagined



A 3d landscape was also suggested, for example from a site-plan within one of the slides. This could be very basically textured, or it could be raised into walls to create the 'maze' environment in the world. Alternatively, the landscape could be influenced by the actual geographical landscape of the origins of the slides.



The group also suggested atmospheric characteristics – for example mist, sunshine or darkness as the day progresses.

The scale of the landscape is also important, i.e. if a participant has to walk over a long distance, this would be for a purpose and by design.

Similarly, if a maze-type landscape is provided, participants should be able to become lost within the maze but should also be able to scale back and pinpoint their position if needed.

The group also discussed 'placing' the user in the world. Information about the geographical region of the artefacts and its broader history could be provided, however this raises broader questions about the sources and positioning of this information.

Lastly, the group strongly wanted to incorporate the characteristics of the glass slides and their projections, and the properties of projected light and colour.

Sound and other Haptics

Sound was discussed in terms of its different sources and characteristics; rather than simply ambient sound, sound / noise emitted from objects or artefacts was also imagined.

The 'feeling of walking' was also imagined – if it could be made more difficult to walk through sand or mud, depending on the environment.

Some other 'feelings' or sounds were also discussed, for example when objects are placed together or when tasks are accomplished.

Critical Analysis

Storytelling & narrative: While a scenario was presented by the group, a narrative in its strict sense was not developed. This can be a positive element, since it allows for a freer exploration of the space.

Goal-based games vs free activity: Some participants were keen on goal-based activities such as treasure-hunts and jigsaw-making. This might be suitable for a younger age-group who might enjoy these activities, whether competitive or collaborative. However, goal-based activities may not be so interesting for more thoughtful users.

Learning & fun: this depends strongly on the user group – fun may be more important for a younger or less knowledgeable group, but a more studious group may prefer to learn more. However, this is not a clear-cut distinction.

Co-creation: The potential for co-creation in learning was not discussed in-depth during the workshop. However this could be a focus of the next sessions in September.

Ethical Considerations: The group considered ethical issues which may come into play when working with historical material located in conflict regions or areas with instability and colonial histories. While no conclusions were drawn, the group asked questions around appropriation, use of cultural heritage, and the (lack of) diversity of the participant group.

Requirements

The following requirements and characteristics were flagged by the participants – in particular with reference to co-creation and collaboration, an ability to manipulate and 'influence' artefacts was recommended.

Co-creation and collaborative capabilities: users should be able to interact, move objects which have been previously moved by other users.

Materiality of objects: objects within the virtual world should have certain characteristics such as solidity, weight, magnetism, sound, opacity, solidity, luminosity, and even elasticity if possible.

Manipulation: users should be able to pick up and move objects around, scale them, and possibly change other characteristics such as their opacity, luminosity etc

Changing atmospheres: textures and atmospheres (e.g. mist, sunshine, darkness) should be present.

Grouped datasets: if a user assumes a particular role, a certain set of artefacts should be made available to them (different to those allocated to a user with another role).

Relevant information: users should be able to see varying degrees of information about the artefacts, eg perhaps a small amount immediately, with more detail available if interested.

Accessibility: standard or better-than-standard accessibility tools should be integrated into the platform's design.

Projected image: since the material included glass-slides, these could be projected, but as in real life, also be projected onto bodies and objects in the virtual world.

Glitches: glitches to be embedded in environments or artefacts, making them behave in unexpeted ways.

Sound: not only ambient, but also emitted from artefacts and becoming louder or quieter based on certain circumstances.

Physical characteristics: can it be made more difficult to walk through sand or mud, depending on the environment.

Recommendations for September sessions

The make-up of the participant group and their understanding of the task in hand is an extremely important element.

Participants should be selected and confirmed in advance, as well as paid for their time – otherwise attendance will be low, and input limited.

As much as is possible, participants should attend all of the workshop, so as not to disrupt the thinking of the group.

A creative atmosphere and creative tools are a must, with a variety of online and offline tools available for participants.

It's also important that each group has a variety of expertise, and that the group leaders are familiarised with their competencies beforehand. Areas and competencies could / should include visual art, sound, curation, history, archival practice, archaeology, anthropology, journalism etc.

A focus can be shifted from narrative to other areas, such as co-creation, ethics, activities, etc, with breakouts within the workshop.

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