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Executive summary

Deliverable D4.11 presents the second and final release of the cultural asset reuse productions and applications developed within the REEVALUATE project (Grant Agreement No. 101132389). Building on the planning established in D4.1 and D4.8, this document reports the results of the second pilot phase across three pilot scenarios, the shared technical enablers underpinning them, and the legal and ethical framework governing the reuse of digitised cultural heritage.

The three REEVALUATE pilots address distinct cultural heritage domains:

- Fashion
- Olympic Games and Music
- Historic Site of Aquileia

Pilot 1 (Fashion) centres on the gamified application "Fashion Time Machine" and a physical garment creation showcase, drawing on digitised artefacts from the MoMu collection in Antwerp. The technical implementation by CERTH uses the SMPL-X body model and a Unity-based clothing pipeline, while FFP merges the partner contributions into the bespoke gamified application. The first published output of the pilot is a modernised sewing pattern named "Mildred", derived from a 1920s piece in the MoMu collection; it is available for purchase on the Fibre Mood platform, and four further patterns are being prepared for the second pilot iteration. Following the bankruptcy of NURO, the original lead beneficiary, FFP assumed responsibility for this deliverable in close collaboration with CERTH. Pilot 2 (Olympic Games and Music) delivers FFP's committed proof-of-concept advertising film, "Olympia", which reuses digitised artefacts from the Olympic Museum of Thessaloniki together with ethnomusicological material from the Ethnological Museum of Berlin (SMB/SPK). The film is developed with reference to the five thematic units elaborated by the Olympic Museum. The production exercises the REEVALUATE enablers in a real creative workflow: the digitised artefacts reach FFP through the Collaboration Enabler and the Marketplace, the DLT-based Asset Tokenisation & IPR Management Enabler secures the copyright agreements before any reuse, and the Context Validation Enabler checks that artefacts are not misused or taken out of context in the film. In addition to the enablers, FFP runs the production itself under Empirica, an open-source framework for measured AI work: every visual claim is anchored to the museum's documentation, what is invented is declared, and each completed scene ships with a machine-generated certificate of provenance (Section 3.7). In preparation, FFP additionally created an extensive set of new 3D assets - historic characters, musical instruments and a large-scale reconstruction of the Olympia site - together with a real-time multi-projector system for the Museum's exhibition spaces (Section 3.6).

The first scenes are complete, and a working trailer assembly integrates the SMB/SPK recordings. Any further material remains a conditional enhancement and cannot be guaranteed at this stage. Pilot 3 (Aquileia) focuses on site-level digitisation of the Titus Macer Domus and artefacts from the National Archaeological Museum, resulting in an interactive virtual tour accessible both on-site and remotely. The shared enablers (the DLT-based Asset Tokenisation & IPR Management Enabler, the Context Validation Enabler, the AI-driven Contextualisation Enabler, and the Collaboration Enabler) have been tested across all three pilots to support copyright management, contextual validation, and cross-institutional workflows; their per-pilot integration status is reported in Sections 2.1.1, 2.2.2 and 2.3.2. The deliverable also addresses the legal and regulatory framework for cultural asset reuse, covering intellectual property rights and data protection rules applicable to digitised artefacts and avatars (see Section 1.10). As the second and final release, D4.11 incorporates the outcomes of the second pilot phase and a more comprehensive evaluation of the reuse applications in public-facing settings.

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Abbreviations

Abbreviations	Full name
AI	Artificial Intelligence
API	Application Programming Interface
CH	Cultural Heritage
CHI	Cultural Heritage Institution
DLT	Distributed Ledger Technology
EAB	External Advisory Board
ECCCH	European Collaborative Cloud for Cultural Heritage
F2F	Face-to-Face
GA	General Assembly (GA)
GUI	Graphical User Interface
KAOS	Knowledge Acquisition in automated specification (Keep All Objectives Satisfied) goal modelling method
KPI	Key Performance Indicator
UI	User Interface
UML	Unified Modelling Language
WP	Work Packages
W3C	World Wide Web Consortium
4DGS	4D Gaussian Splatting
CACAO	Cultural Artefacts' Contextual Ontology
FAIR	Findable, Accessible, Interoperable, Reusable
FBX	Filmbox (3D interchange file format)
GLB	Binary glTF (3D file format)
HDCE	Human-Driven Contextualisation Enabler
IPR	Intellectual Property Rights

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LLM	Large Language Model
MoCap	Motion Capture
NFT	Non-Fungible Token
OBJ	Wavefront Object (3D file format)
POC	Proof of Concept
SMPL-X	Skinned Multi-Person Linear model - eXpressive
UDP	User Datagram Protocol
UMA	Unity Multipurpose Avatar
UV	Texture coordinate mapping (2D coordinates on a 3D surface)

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1 Introduction

This document provides the second and final release of the cultural asset reuse productions and applications for the REEVALUATE project. The development and documentation of these productions and applications is the primary output of Task 4.4 (Cultural Asset ReUse Productions & Applications, M13–M29), which delivers a first release in D4.4 and this final release in D4.11 (M30, July 2026). This deliverable, documents the digitisation processes, asset production methods, and application development undertaken across the three pilots, and reports the results of the second pilot phase. Relative to Release 1, the principal additions are the results sections of the second pilot phase for each pilot (Sections 2.1.4, 2.2.7 and 2.3.4), the completed application development documented in Section 3, including the AI-assisted production of the advertising film "Olympia" under the open-source Empirica framework (Section 3.7), and the updated legal framework in Sections 1.10 and 1.11.

1.1 Transition of Lead Beneficiary Responsibilities

On 1 November 2025, NURO — the partner originally responsible for the development of the Fashion Time Machine gamified application and lead beneficiary of this deliverable — entered bankruptcy proceedings and ceased all project activities. Consequently, FFP assumed full responsibility for the coordination and delivery of this deliverable and the related WP4 tasks, including the application development previously assigned to NURO. This transition required FFP, with the guidance and support of CERTH, to establish direct communication with all partners involved in the work package — 3DR, EFHA, SMB, MoMu, OLYMPIC, ARTHUR, and AQUILEIA — to assess the status of each pilot, collect outstanding contributions, and ensure continuity of work. FFP would like to express its sincere thanks to CERTH at this stage for their invaluable guidance throughout this process. A coordination meeting was held in Thessaloniki on 28 November 2025 to align on the revised roles and the path forward. FFP began work on this deliverable as soon as the situation was clarified following the Thessaloniki meeting. FFP and CERTH have since established a close and productive working partnership to consolidate the deliverable and drive the development of the reuse applications.

For Pilot 1 (Fashion), FFP has taken over NURO's role in developing the "Fashion Time Machine" — a gamified application allowing users to interact with digitised historical fashion from the MoMu collection. No usable project output was handed over by NURO before it ceased activities: to FFP's knowledge, neither documentation nor source code for the gamified application was delivered, and none of the preparatory work could be carried forward. FFP therefore did not continue an existing development effort but started the application work from scratch, on top of CERTH's enabler engine, following the Thessaloniki meeting of 28 November 2025. Rebuilding the technical basis, re-establishing direct working relationships with every partner in the work package, and collecting the outstanding contributions absorbed the period that had been foreseen for consolidating and finalising this deliverable, and account for its later submission. The scope of the deliverable is unaffected: the work has been completed in full, and the second release is submitted at the date recorded in the Document Information table. Alongside the gamified application, the second showcase — a physical garment creation experience using sewing patterns derived from MoMu collection items in cooperation with Fibre Mood — continued as originally planned. FFP and CERTH have worked closely together to deliver the application, and this second release (D4.11) presents the outcomes of that work.

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1.2 Deliverable Outline

The productions and applications are developed within Work Package 4 (Piloting and Validation of the REEVALUATE framework), specifically in Task 4.4 (Cultural Asset ReUse Productions & Applications, M13–M29). They are subsequently deployed in Task 4.5 (Pilot execution – Implementation of the REEVALUATE framework in CHIs) and assessed in Task 4.6 (Pilot results assessment and evaluation). The primary purpose of this document is to describe the specific Cultural Heritage (CH) asset reuse applications developed and tested in the pilot phase. Each pilot case requires a unique production or application that creatively reuses digitised artefacts, developed by the industry pilot partners (FFP, 3DR, and formerly NURO) to test and validate the enablers of the REEVALUATE framework:

Pilot 1 (Fashion): a gamified application — the "Fashion Time Machine" — and a physical garment creation showcase.

Pilot 2 (Olympic Games and Music): an advertising film utilising digitised artefacts from the Olympic Museum of Thessaloniki and SMB/SPK.

Pilot 3 (Aquileia): a 3D virtual tour of the historic site.

As the three pilots are largely disjunct in terms of both scope and cultural heritage partners involved, this document presents each pilot individually. All pilot descriptions nevertheless follow an identical structure, to ensure consistency and comparability across the different domains and presentation formats.

The document is structured as follows:

Section 1 (Introduction) describes the transition of lead beneficiary responsibilities from NURO to FFP and CERTH. It also sets out the deliverable's goals, its relation to other deliverables, an overview of each pilot, the dataset and storage approach, and the legal framework for reuse.

Section 2 (Pilots) details each pilot individually, covering the themes, partners, and cultural heritage assets involved; the enabler integration status; the challenges and approaches related to creative reuse; the digitisation and reuse status; and the results of the second pilot phase.

Section 3 (Reuse Applications and Production) documents the 3D asset production and digitisation methods per pilot, together with the application development and productions: the Pilot 3 virtual tour, the Virtual Museum, the Fashion App, and the advertising film.

Section 4 (Conclusions & Outlook) provides the conclusions and an outlook on upcoming work.

1.3 Deliverable Goals

The purpose of this deliverable is to detail the cultural heritage reuse applications and productions planned and undertaken within WP4. It serves as a crucial element for the success of the work package, as it provides the necessary resources and documentation for the subsequent evaluation of the pilots, which in turn forms the basis for evaluating the enablers developed within REEVALUATE.

Specifically, this deliverable aims to illustrate the digitisation processes applied to cultural artefacts used for validating the project's enablers, and to document the development of software applications that showcase the creative reuse of cultural heritage. The document covers the status of digitisation,

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asset production methods, and application development across all three pilots. As the second release, this deliverable reflects the progress made since Release 1, incorporates organisational details that were not yet available at the time of the first release, and provides a deeper examination of the results and outcomes of the creative reuse applications.

1.4 Relation with other deliverables

This deliverable translates the pilot plans established in D4.1 (Definition and planning of pilots) and further refined in D4.8 (Definition and planning of pilots, Release 2) into concrete creative productions and reuse applications. It builds upon the digitisation activities documented in D2.1 and D2.4 (Identification and digitisation of cultural heritage artefacts for the use during pilot phase, Releases 1 and 2), which provide a detailed overview of the artefacts selected, the digitisation approaches and technologies adopted, and the resulting digital assets available across all three pilots. Task 2.1 (Cultural Items Identification & Digitisation, M6–M28) concluded in April 2026, so the asset base described there is final for the purposes of this deliverable.

The reuse applications described herein integrate enablers developed in Work Package 2 (Semantic Management Enablers) and Work Package 3 (Collaboration & IPR Management Enablers), and are aligned with the user needs and usage scenarios identified in D1.3 (User needs and usage scenarios). The deliverable also draws on the integrated platform work documented in D4.3 (Integrated REEVALUATE Platform), which brings together the technical components required for pilot execution. As the second release, it reflects the further progress made across these work packages since Release 1 and incorporates the additional developments now available.

1.5 Notes on the Approach

Each of the three REEVALUATE pilots is carried out with dedicated cultural heritage partners and uses a different format to present digitised content: an online activity and physical creation (Pilot 1), a physical museum exhibit (Pilot 2), and a self-guided tour through a historic site (Pilot 3). This spread of formats ensures the project's enablers are validated across distinct, non-overlapping use-cases. Sections 1.6 to 1.8 introduce each pilot in turn; Section 2 reports the results of the second pilot phase for each.

1.6 Pilot 1 - Fashion

The first pilot activity involves a collaboration between EFHA, the MoMu – Fashion Museum Antwerp, and the Belgian company Fibre Mood (a DIY-platform for fashion). The pilot began with the digitisation of various fashion heritage artefacts from MoMu. The pilot itself consists of two different showcases. The first showcase is a gamified application titled "Fashion Time Machine." In this application, users will be able to interact with digitised historical fashion pieces, garments, and collections, exploring fashion heritage through playful challenges. The original concept envisaged different levels based on various fashion eras, style challenges, and social sharing features; FFP has since established how far that initial vision could be carried over as the application was rebuilt on top of CERTH's enabler engine, and Section 2.1 reports the outcome. Following the transition of lead beneficiary responsibilities described in Section 1, FFP has taken over development of this application in close collaboration with CERTH, who are providing the technical engine for avatar creation, motion transfer, and digital clothing. a

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The second showcase allows users to create their own physical garments, based on sewing patterns derived from items in the museum's collection, enabling them to produce their own personalised version of a historical garment. The showcase has been developed in cooperation with Fibre Mood and extends an earlier collaboration between MoMu and Fibre Mood, in which a sewing pattern was produced from MoMu study-collection object ST2144, a 1930s silk jacket. That earlier project served as the prototype for the workflow adopted here and is documented in D4.1 (Definition and planning of pilots), Section 5.2.4. The collaboration continues MoMu's engagement with fashion-making as a social media–based and community-supported activity. Pilot 1 deals exclusively with virtual assets in an online presentation context: while the pilot actively encourages the creation of physical fashion items by users, the resulting garments fall outside the direct scope of the project deliverables and are a secondary outcome of the reuse experience.

1.7 Pilot 2 - Olympic Games and Music

The second pilot is a collaborative initiative between the Olympic Museum of Thessaloniki, the Media Department of the Ethnological Museum and the Museum of Asian Art in Berlin (SMB/SPK), and FFP Productions of Austria. Its objective is to validate the REEVALUATE enablers in a real museum setting: FFP's committed contribution is a single proof-of-concept advertising film, "Olympia", reusing digitised cultural heritage assets, produced for and hosted within the Olympic Museum's planned immersive exhibition "The Olympic Experience" at its premises in Thessaloniki (opening planned for November 2026). The exhibition — the Museum's own undertaking, to which the pilot contributes — explores the multifaceted relationship between the Olympic Games and music from antiquity to contemporary times, structured around five thematic units combining artefacts from both institutions. The pilot involved the digitisation of a selection of artefacts from both collections — including audio material from the Ethnological Museum of Berlin and artefacts related to the Olympic Games from the Olympic Museum of Thessaloniki — with appropriate copyright tagging and acquisition to ensure effective management of the artefacts' intellectual property rights, using the DLT-based Asset Tokenisation & IPR Management Enabler developed within the project. FFP incorporated materials from this partnership, highlighting the potential of digitised heritage material in contemporary advertising practices within the Creative Industries and Advertising sectors. Building on this material, FFP is producing the film inspired by the five thematic units developed by the museums and the selected digitised artefacts (see Section 2.2.3); the first scenes are complete, and the production — carried out through an AI-assisted pipeline in which the digitised artefacts serve as the factual ground truth of every scene — is reported in Sections 2.2.7 and 3.7. The pilot also included storytelling development, historical research, the compilation of an asset list for digitisation, the execution of the digitisation process itself, and metadata review and enrichment. Historical archival recordings and music from around the world (SMB/SPK) enrich the film by reflecting the international character of the Games and making the cultural diversity of the participating nations audible, reinforcing the core values of the Olympic Movement: friendship, respect, peace, and solidarity across national borders. Any further material beyond the committed film — such as additional thematic videos or projection-based presentations within the exhibition spaces — is pursued only where resources permit (see Section 2.2.6). In addition, Olympic and SMB/SPK are working to try to organize a small, separate satellite exhibition on music and sports in Olympia, which will likely showcase the results of the REEVALUATE project and serve the purpose of dissemination.

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1.8 Pilot 3 - Historic Site of Aquileia

The third pilot, led by 3D Research (3DR), centres on the ancient city of Aquileia — continuously inhabited since 181 BC and of exceptional archaeological significance. 3DR digitised key sites and artefacts, producing the assets for a virtual tour of the Titus Macer Domus. The tour aims to raise awareness of the site among both residents and visitors to northern Italy. The tour includes immersive experiences accessible through tablets or VR viewers, on-site QR codes for accessing additional online content, and interactive touch screens. It primarily supports self-guided visits through Aquileia, while also being available as a purely virtual online tour for remote users.

1.9 Dataset & Storage

Certain activities carried out during the project — most notably Task 6.4 (Data Management and Governance, Regulatory, Societal, Ethical and Gender Issues) within Work Package 6 (Project Management) — are aimed at mapping the datasets produced by various partners in their respective project activities. Given the conclusions and guidelines provided under Deliverable D6.3 (Data Management Plan and Regulatory, Social, Gender (GEP) and Ethical Issues Report, Release 1), which is the output of that task, partners are expected to maintain datasets from their respective pilots in accordance with those guidelines and to adhere to the FAIR principles and the relevant ethical standards. Up to M30, approximately 26 datasets have been identified using the dedicated Data Monitoring Tool, and the responsible partners have been asked to confirm their adherence to the defined principles and standards. The following table lists the datasets pertinent to this D4.11 and the pilot activities:

WP	Dataset	Responsible Partner
WP2	Olympic Museum Collection Dataset	Olympic Museum
WP2	Study collection dataset MoMu	MoMu
WP2	Synthetic Historical Audio Recordings	CERTH
WP2	Public Sensing & Thematic Prioritization Data	HYP (Lead), supported by CERTH
WP2	past digitised models	Aquileia
WP2	new digitised models	3DR
WP2	description of objects	Aquileia
WP3	Creative Reuse Dataset	FS
WP3	Information Retrieval Dataset	KU Leuven
WP3	Matchmaking Dataset	KU Leuven
WP4	Artefacts and their relevant metadata featured in Marketplace	Aquileia
WP4	FONDAZIONE AQUILEIA - interview/questionnaire (PILOT 3)	Aquileia
WP4	Olympic Museum Collection Dataset	Olympic Museum

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WP4	Study collection dataset MoMu	MoMu
WP4	SMB BERLIN	SPK Berlin

Table 1: Extract from the Data Monitoring Tool

Responsible partners are asked quarterly to review and update details of their datasets and provide responses to contextual questions. All historic versions of the Data Monitoring Tool are stored for reference.

1.10 Framework & Legal Background of Reuse

1.10.1 Aim & scope

This section provides a high-level overview of applicable intellectual property rights (IPR) – in particular copyright – and personal data protection legal frameworks as they pertain to the use of digitised artefacts and the creation and use of avatars. In doing so, this section builds upon the analysis introduced in D1.1 Comprehensive guide of the benefits, opportunities, risks and gaps in the management of cultural heritage and D6.3. Whilst it presents the generally applicable principles, it does not address any specific use cases.

In scope of this section are IPRs related to the reuse of digitised artefacts, as well as data protection rules applicable to the creation and reuse of such artefacts, including avatars. Outside its scope are matters such as the reuse of original artworks (for example, historic artefact pieces or fashion items), which have already been partially addressed under T1.3 User needs and usage scenarios. Additionally, personality rights (such as image rights and the commercial use of personal identity elements) and the reuse of data, datasets, or databases are also not considered here.

1.10.2 Intellectual property rights in the digitised artefacts

Generally, any work that (1) is fixed (i.e., is expressed in a fixed way, as opposed to being a mere idea) and (2) is the author's own intellectual creation will be protected by copyright. As a result, the copyright owner will have certain exclusive rights, such as the right to make reproductions or adaptations of the work (however, anyone may refer to copyright works, nonetheless). There exist certain exceptions or permitted uses where it is not necessary to obtain the author’s permission; however, such exceptions are limited and concern the use of a copyright work by incidental inclusion, or in the course of research, for example.

Such exclusive rights granted to the copyright owner mean that, in practice, anyone wishing to reuse or exploit a digitised artefact must obtain authorisation unless their activity clearly falls within these narrowly defined exceptions. This principle is particularly relevant in the REEVALUATE context, where the reuse of digital artefacts is subject to the rights holder’s permission. In other words, if anyone (such as an end user) wants to use a digitised artefact, they should obtain permission from the relevant copyright holder (presumably the creator of the digitised artefact, such as the museum).

Moreover, the increasing integration of artificial intelligence into the creation and use of digital artefacts introduces further complexity, as lawmakers still have not defined the approach to two key questions, amongst others:

1. Are works generated by AI copyrightable?

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2. Does training of large language models (LLMs) on copyright works constitute their lawful use?

Regarding the former, in the EU, copyright protection is granted to authors who can show that the work is their own intellectual creation. The standard requires that the work reflect the author's personality by expressing their creative abilities through free and creative choices.[1] The Court of Justice of the European Union (CJEU) has opined that there is no room for free and creative choices where the work was dictated by technical considerations, rules, or constraints.[2] As a result, one may argue that works that are entirely generated by AI may not qualify for copyright protection. Uncertainty, however, remains in the case of work created *with the aid of* AI. The human-centric nature of EU law, as well as the ongoing uncertainty regarding AI-generated works, has also been recently confirmed and highlighted by the European Parliament's July 2025 study on *Generative AI and Copyright.*[3]

Regarding the latter, under current EU law, training large language models (LLMs) on copyright-protected works may be lawful when carried out under the text and data mining (TDM) exceptions in Articles 3 and 4 of the DSM Directive,[4] if any opt-out by rights holders is respected. These exceptions permit acts of reproduction and extraction for analysis, but do not extend to redistributing datasets or reproducing protected content in outputs. Recent case law[5] confirms that memorisation during training is generally permissible, whereas generating outputs that replicate copyrighted material constitutes infringement.[6] Additionally, compliance with transparency and opt-out obligations under the AI Act[7] is essential to mitigate legal risk.

1.10.3 Privacy rights in avatars

Pilot 1 could present a personal data issue that needs to be addressed. *Personal data* includes and refers to any information that can identify an individual.[8] In the context of REEVALUATE, this will often involve usernames, IP addresses, or images of individual users' faces, as in this pilot.

Processing of personal data is lawful only if it is based on a valid legal ground, such as consent, necessity for contract performance, or legitimate interests pursued by the controller. Where consent serves as the legal basis, it must be a *"freely given, specific, informed, and unambiguous indication of the data*

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[1] Case C-145/10 Painer v Standard Verlags GmbH et al [2012] ECDR 6

[2] Case C-604/10 Football Dataco v Yahoo! UK Ltd [2010] 2 CMLR 24

[3] European Parliament, 2025. Generative AI and Copyright. European Parliament's Policy Department for Justice, Civil Liberties and Institutional Affairs. Page 92. Available at https://www.europarl.europa.eu/RegData/etudes/STUD/2025/774095/IUST_STU(2025)774095_EN.pdf. Accessed on 11 December 2025.

[4] Directive (EU) 2019/790 of the European Parliament and of the Council of 17 April 2019 on copyright and related rights in the Digital Single Market and amending Directives 96/9/EC and 2001/29/EC ('DSM Directive')

[5] Hamburg Regional Court (2024–2025) – LAION Dataset Cases, GEMA v. OpenAI (2025), Like Company v. Google Ireland (C-250/25, pending before CJEU)

[6] Similarly, in the UK, a recent judgement in *Getty Images v Stability AI [2025] EWHC 2863 (Ch)* has distinguished between the training phase and the output phase, and focused on whether models embody infringing copies, generally finding they do not, while leaving output-related infringement as the primary risk.

[7] In particular Article 53 of Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act)

[8] Regulation (EU) 2016/679 of the European Parliament and of The Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation, GDPR), Art. 4(1)

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subject's wishes, by which he or she, by a statement or by a clear affirmative action, signifies agreement to the processing of personal data relating to him or her."[9] For this pilot project, consent is probably the most suitable legal basis for taking, uploading, using, creating avatars from, storing, or otherwise processing a user's picture. As a result, the responsible partner must obtain proper consent, such as asking users to sign a consent form in line with the above requirements.

Aside from obtaining valid consent, the responsible partner who will determine the means and purposes of the processing of the data (i.e., the *controller*)[10] will be required to comply with several additional obligations under the GDPR. In particular, they will be required to implement appropriate technical and organisational measures to ensure security of the processed personal data,[11] and maintain a record of processing activities reflecting the categories of processed personal data, purposes of such processing, details of any third parties with whom they share the data, and details of the technical and organisational security measures in place.[12] They will also be required to provide to the user certain details about how the user's data is processed, as well as details concerning some of their rights with respect to the data[13] – including the right to withdraw consent, right of access to data processed by the controller, right not to be subject to automated individual decision-making, and the right to complain to national supervisory authority. Those details must be provided to the individual user when personal data is obtained, so it would be appropriate to include them in the consent form. In parallel with these ongoing considerations, it is important to note the most recent initiatives at the EU level, particularly the European Commission's Digital Package[14] and the Digital Omnibus[15] presented within it. The Digital Omnibus introduces a suite of legislative updates aimed at harmonising and modernising digital regulations across the EU, with a strong focus on fostering innovation and ensuring robust safeguards for users. Notably, while the package includes proposed amendments to the GDPR, these changes are largely tailored to address personal data processing in the context of artificial intelligence. As such, they are unlikely to materially affect the specific data protection requirements outlined above for the creation and use of personalised avatars within the pilot, as the amendments do not directly alter the core principles or obligations relevant to this context. In the implemented Virtual Museum application, these considerations are addressed by design for the motion-capture path: the webcam feed is processed entirely on the local machine, no images or body-landmark data are stored or transmitted, and the feed never leaves the installation (see Section 3.4). This privacy-by-design implementation minimises the personal data processing described above for the live try-on experience.

In conclusion, while the integration of AI and digital technologies within REEVALUATE pilots offers significant opportunities for innovation and user engagement, it also introduces complex legal and

[9] Ibid., Art. 4(11)
[10] Ibid., Art. 4(7)
[11] Ibid., Art. 32
[12] Ibid., Art. 30
[13] Ibid., Art. 13
[14] European Commission, 2025. Digital Package. Publications Office of the European Union. Available at https://ec.europa.eu/commission/presscorner/api/files/attachment/881887/Factsheet%20Digital%20Package.pdf. Accessed on 11 December 2025.
[15] Proposal for a Regulation of the European Parliament and of the Council amending Regulations (EU) 2016/679, (EU) 2018/1724, (EU) 2018/1725, (EU) 2023/2854 and Directives 2002/58/EC, (EU) 2022/2555 and (EU) 2022/2557 as regards the simplification of the digital legislative framework, and repealing Regulations (EU) 2018/1807, (EU) 2019/1150, (EU) 2022/868, and Directive (EU) 2019/1024 (Digital Omnibus)

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ethical considerations, particularly regarding copyright and personal data protection. Aiming to comply with EU copyright and data protection laws and to embrace recent regulatory developments will be crucial for fostering trust and safeguarding the rights of all participants. As these pilots' progress, ongoing vigilance and adaptability will remain essential to navigate the evolving landscape and to fully realise the potential of these pioneering digital initiatives.

1.11 Legal Framework - Updates since Release 1

Since Release 1, no material legal, regulatory or policy development has been identified that would require amendment of the analysis in Section 1.10. The general core position remains unchanged: reuse of digitised cultural heritage assets should continue to be managed through rights clearance, appropriate licensing and contextual validation; AI-assisted reuse continues to be assessed by reference to the requirement that copyright protection is generally dependent on human intellectual creation and the exercise of free and creative choices; and any processing of user images or avatar-related data should remain subject to the GDPR requirements identified in Release 1, including a valid legal basis, transparency information, security measures and appropriate records of processing.

In data protection, the Digital Omnibus remains an ongoing legislative simplification initiative rather than an adopted change to the GDPR. As a result, the Release 1 assessment for the Fashion pilot's possible avatar functionality remains valid: if user images, video, biometric-like measurements or avatar parameters are processed, the responsible partner should continue to ensure a clear legal basis, appropriate user-facing information, data minimisation, security, and the ability for users to exercise their rights. The proposals do not presently remove or materially reduce those practical compliance requirements.

For the individual pilots, the resulting finding is that no change of approach is required. Pilot 1 remains subject to the data protection considerations associated with avatar and image processing, as well as the management of rights in fashion assets and derived patterns. Pilot 2 continues to require the clearance and documentation of the use of Olympic Museum and SMB/SPK visual and audio materials, including the consideration of contextual and ethical aspects relating to music and ethnographic content. Pilot 3 remains concerned with permissions, attribution, cultural heritage sensitivities and contextual accuracy in relation to Aquileia site and artefact assets.

2 Pilots

2.1 Introduction to Fashion Pilot

Pilot 1 brings together EFHA, MoMu – Fashion Museum Antwerp, and Fibre Mood around the digitisation and creative reuse of fashion heritage. As reported in D4.1, work began with digitising selected artefacts from MoMu's collection, resulting in two showcases.

The first showcase is a gamified application titled "Fashion Time Machine" composed of two components in which users will interact with digitized historical fashion on digitally created photo-realistic "avatars", dressed in garments from the collection, and exploring fashion heritage through playful challenges. The original concept envisaged different levels based on various fashion eras, style challenges, and trivia features.

FFP concluded that this initial vision can be extended with highly realistic garment simulation, multi-view 3D modeling with appropriate environmental lighting and most importantly natural motion

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driven by professional fashion model catwalk footage captured in real-life productions. To meet these challenges FFP developed a novel AI-assisted enabler engine, published at SIGGRAPH2026[16], and used that pipeline to produce the final 3D models and interactive footage used in the final Fashion App implemented in Unity. To highlight the best of both worlds a decision was made to deploy CERTH's enabler engine (Unity-based 3D simulation, called 'Virtual Museum') as a stand-alone application and FFP's 'Fashion App' which focuses on showing the selected photo-real dresses moving seamlessly on the human body along with educational and curatorial aspects about the 'behind the scenes' processing steps and interesting trivia facts the users will learn about.

Engaging stakeholders and testing these enablers is planned after mid-September 2026, when the final versions of the two desktop applications will be released to MoMu. Stakeholders will be invited into the museum for a dedicated session, with the users divided between the CERTH and FFP applications. A total of 25 users is foreseen, 12 to 13 per application, each group split between individual re-users (8 to 9) and SMEs (maximum 4).

The second showcase enables users to create their own physical garments, based on sewing patterns derived from items in the museum's collection, allowing them to produce personalised versions of historical designs. It is developed in close cooperation with Fibre Mood, building on the earlier MoMu – Fibre Mood collaboration introduced in Section 1.6. The first pattern was based on MoMu collection item ST2202. In the first pilot phase it completed the full workflow from selection and research through pattern creation, adaptation and grading by Fibre Mood, photo shoot and creating working instructions, to publication on the Fibre Mood platform. Communication, dissemination and merchandise activities have also commenced. For the second pilot phase, four additional patterns are planned, following the same pipeline. The selected objects are:

– a blouse (ST81114AB) and trousers (ST81116) of a turn-of-the-century cycling ensemble[17]

– a Japanese kimono (ST80881)[18]

– an 18th century women's corsage (ST503)[19]

Below are the images of the selected artefacts, and in the following sections more details will be provided on these selected artefacts and the pilot workflow.

[16] https://dl.acm.org/doi/10.1145/3799825.3818690
[17] http://data.momu.be/ark:34546/m2rbtz
[18] http://data.momu.be/ark:34546/mt76pz
[19] http://data.momu.be/ark:34546/m1jwzc

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Figure 1: Cycling ensemble



Figure 2: Kimono



Figure 3

2.1.1 Enabler Integration Status

The following table summarises the current integration status of the REEVALUATE enablers within Pilot 1. Enabler descriptions are based on D4.1 and D4.8, Definition and Planning of the Pilots (R1 & R2).

Enabler	Description (from D4.1)	Status	Responsible	Expected
AI-Driven Creative Reuse Enabler	In the context of the game, the enabler allows players to combine and further develop existing digitised clothing items from MoMu's collection to create new, unique outfits, and clothing designs using generative AI.	Connected to the application over the API, and demonstrated on the first digitised artefact (ST2202). Onboarding of four further MoMu garments pending receipt of the assets from MoMu.	CERTH (development), FFP (integration), MoMu (testing)	Testing will take place in the 1st half of October 2026.
Collaboration Enabler	Facilitates search, discovery and reuse of digitised fashion artefacts from MoMu's collection through registration, multimodal search (text, image, combined), and matchmaking between MoMu, FFP, CERTH and Fibre Mood	MoMu has ingested 1,796 study collection records into the Knowledge Graph with KU Leuven and LINKS.	KU Leuven / LINKS (development), MoMu (testing)	After the 1st pilot phase, further testing of the enabler is envisioned during 2nd pilot execution (mainly September 2026).
Contextualisation Enabler	Enriches MoMu fashion artefacts (human- & AI-driven) with contextual descriptions, extracted from curatorial notes, images and external sources, integrating them into the REEVALUATE Knowledge Base via the CACAO ontology	In progress; dependent on Knowledge Graph ingestion; MoMu internal testing team of 3–5 people ready.	LINKS (development), MoMu (testing)	After a first testing round, involving mainly internal staff, a more extensive testing campaign of the Contex-

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				tualisation enablers is foreseen for the 1st half of September.
DLT/IPR Management Enabler	Smart contracts governing reuse agreements between MoMu and its partners (FFP, CERTH, Fibre Mood), ensuring appropriate copyright agreements are in place before creative reuse of artefacts	In progress, Enabler tested in 1st pilot phase. For 2nd phase: Marketplace upload of additional content planned end of August by MoMu;	CERTH (development), MoMu, FFP and CERTH, Fibre Mood (testing)	Testing of the enablers is foreseen for the 2nd half of September.
Context Validation Enabler	Validates that digitised artefact is not misused or taken out of context; detects inappropriate content including violence, nudity, hate speech, crime scenes, and deep fakes	In progress: Tested at pilot level in 1st execution. Enabler is ready for 2nd pilot phase.	CERTH (development). MoMu (testing)	2nd pilot phase anticipated September 2026.

2.1.2 What are the challenges and approaches in terms of reuse

To ensure the successful execution of Pilot 1, it is essential to identify potential risks that could impact the Fashion pilot. In addition, key stakeholders for all pilots have been identified and described. The main challenges related to reuse can be summarised as follows:

Selecting inappropriate cultural assets: There is a risk of choosing content that lacks appeal, storytelling potential, visual quality, or is difficult to adapt for reuse. **Action**: Implement a careful and thorough selection process involving different project partners and stakeholders with proven expertise. MoMu's Study Collection provides a strong foundation for the selection process, supported by two iterations designed to validate and refine the approach. During the first iteration, strong engagement was observed across social media channels, and a significant number of ST2202 patterns were successfully sold through the Fibre Mood platform. This positive market response has substantially de-risked the second iteration, and no further action is required from this perspective.

Intellectual Property Rights: Copyright restrictions or claims may limit the use and reuse of cultural assets**. Action**: Prioritise objects from the Study Collection that are suitable for creative reuse, focusing on assets with no identifiable copyright holders or on older materials with minimal intellectual property constraints. For newly developed assets created through the reuse process, establish open-license agreements with the respective creators. In the second iteration, only no- or low-risk artefacts were selected, and where applicable, new assets were produced under the same open-license framework, ensuring consistency and minimising intellectual property risks.

Technical digitisation workflow: As detailed in the following section (cf. infra), creating Pilot 1 is complex and requires creativity, craftsmanship, and advanced digital skills. **Action**: The workflow builds on previous collaborations and experiments, rather than starting from scratch. MoMu's partnership with Fibre Mood leverages earlier projects, making the reuse of cultural assets for the "Pattern Pilot" a more familiar process. For the gaming pilot, there remains a risk of technological incompatibilities between MoMu's various digital assets and the pilot application being developed by CERTH/FFP. How-

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ever, regular communication between partners, combined with a proactive and collaborative approach that includes the development and testing of multiple prototypes based on MoMu's assets, provides the strongest assurance of a successful outcome and effective pilot implementation.

Engaging stakeholders to test enablers: Enablers can only be validated if sufficient stakeholders interact with the pilot**. Action**: This risk is considered manageable, as MoMu and Fibre Mood have extensive user and visitor networks, supported by a variety of communication channels that can be leveraged to promote participation. Results from the first iteration demonstrated strong interest in the fashion pilot across different stakeholder groups, making low engagement unlikely. Nevertheless, additional efforts may be required to clearly communicate the objectives of the REEVALUATE project and to further optimise the alignment between the pilot use cases, the digitised datasets, and the functionalities of the enablers. This is particularly relevant for the Gaming pilot, which has not yet been tested and may require targeted stakeholder engagement and onboarding activities.

2.1.3 Reuse status, assets digitisation status

During the 1st pilot iteration, one of the five objects was selected and included as a prototype in the "Pattern Pilot". This cultural asset (see Figure 4) was a 1920s silk evening dress, embroidered with sequins (**Error! Hyperlink reference not valid.**).

The dress evokes the vibrant atmosphere of the Jazz Age and was clearly worn for a festive occasion, offering rich opportunities for storytelling. It symbolises the freedom and emancipation of women in the 1920s, while its exuberance and touch of decadence allow for a narrative bridge to the Great Depression, which ushered in a very different fashion era. As the object is approximately 100 years old, and bears no name tag, it can be considered free of identifiable copyright holders, making ST2202 a low-risk candidate for open reuse. Conveniently, its cutting pattern was relatively simple, lowering the threshold for creative reinterpretation.



Figure 4 MoMu Dress #1



Figure 5 MoMu Dress #2

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For the Fashion Pilot, the MoMu team created new digital assets, including:

• A historically accurate (2D) cutting pattern

• A full-page contextual story highlighting the artefact's historical significance

• Additional images for documentation purposes / game developer (e.g. photographs from multiple focus points for photogrammetric renderings)

• A 3D replica using CLO3D digital design software

Fibre Mood reused the original object, its historically correct 2D pattern, and the other digital assets created by MoMu, reworking and reinterpreting them to create a new dress and pattern called "Mildred" (see Figure 5). This is not an exact replica but a modernised version of the 1920s dress, retaining the Jazz Age aesthetic while adapting to contemporary materials, techniques, and sizing. The pattern is available for purchase online via Fibre Mood's webshop.

The dedicated Fibre Mood webpage[20] (available in English and Dutch language) features the pattern (sizes XS to XXL), detailed descriptions, instructions, sizing tables, recommended fabrics, material lists, and user reviews. A professional photoshoot was organised, showcasing the modern interpretation of the dress worn by a fashion model.

As part of the collaborative framework for this project, CERTH has received a 3D fashion asset from the pilot partner MoMu, digitised from the MoMu collection. This asset serves as the foundational garment for integration into the Fashion Time Machine gamified application. Using the SMPL-X body model and Unity-based clothing pipeline developed by CERTH (see Section 3.4), the digitised garment is rigged to parametric avatars, enabling users to visualise historical fashion pieces on their own animated digital characters. This cross-partner workflow — from museum digitisation (MoMu/EFHA) to technical integration (CERTH) to application development (FFP) — exemplifies the REEVALUATE reuse chain in practice.

2.1.4 Results from the 2nd pilot phase - Fashion App

For the second phase of the Fashion Pilot, four additional objects were selected by MoMu in collaboration with the other pilot partners. At the time of writing this deliverable, not all activities required for the development of the Pattern Pilot, led by Fibre Mood, had been completed. However, it is expected that all preparatory activities will be finalised before 1 September, when the second pilot iteration will commence and stakeholder engagement activities will take place.

For all selected artefacts, the cutting patterns have been prepared and vectorised by MoMu. In addition, texture scans have been produced for all objects, apart from the hand-painted kimono. Due to the exceptionally large texture scan required for this object, an alternative approach has been proposed based on the use of a standard texture library. Furthermore, MoMu has prepared 3D textured models for all four artefacts.

[20] https://www.fibremood.com/nl/products/mildred-dress?srsltid=Afm-BOoqLAtYg9m1cH7STKZvEnQY5Bi7biKOS4SDXkOznN-3tf4w2Ku-e

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MoMu has also developed contextual and storytelling content for each object. The finalisation of these texts is planned for August, once the Fibre Mood prototypes have been completed. In collaboration with Fibre Mood's creative team, the narratives will be refined to highlight the most relevant historical, creative, and structural features of each artefact.

These assets will serve as key inputs for both the Pattern Pilot and the Gaming Pilot and will be uploaded to the REEVALUATE repository and will be reused across the different pilot activities.

2.1.5 Pattern Pilot:

Fibre Mood is currently developing four additional DIY packages. Each package will include the following components:

• A real-life replica of the museum artefact, reinterpreted by Fibre Mood and adapted to contemporary fashion practices.

• A paper and digital sewing pattern, graded from XS to XXXL (sizes 32 to 60), including cutting and stitching lines and based on the selected museum object. The patterns will be provided in print-friendly formats suitable for both A0 and A4 printing.

• Size charts.

• Detailed instructions and work descriptions available in English, French, German, and Dutch.

• A recommended list of materials, accessories, fabrics, and tools required to complete the project, including specifications related to lining, finishing, and construction techniques where relevant.

• Professional photography featuring models wearing the completed garments, complemented where appropriate by illustrative images of the project. A single integrated photoshoot covering all REEVALUATE artefacts is planned for the second half of August.

• Dedicated social media communication channels that will enable Fibre Mood community members to share their creations, experiences, and results. These activities are scheduled to be launched in September.

• The four DIY packages will be published on the Fibre Mood website and will also be made available for purchase through the MoMu museum shop in the beginning of September.

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Figure 6: Interpretated replica of the cycling trousers (ST81114), named ‘JON’ by Fibre Mood

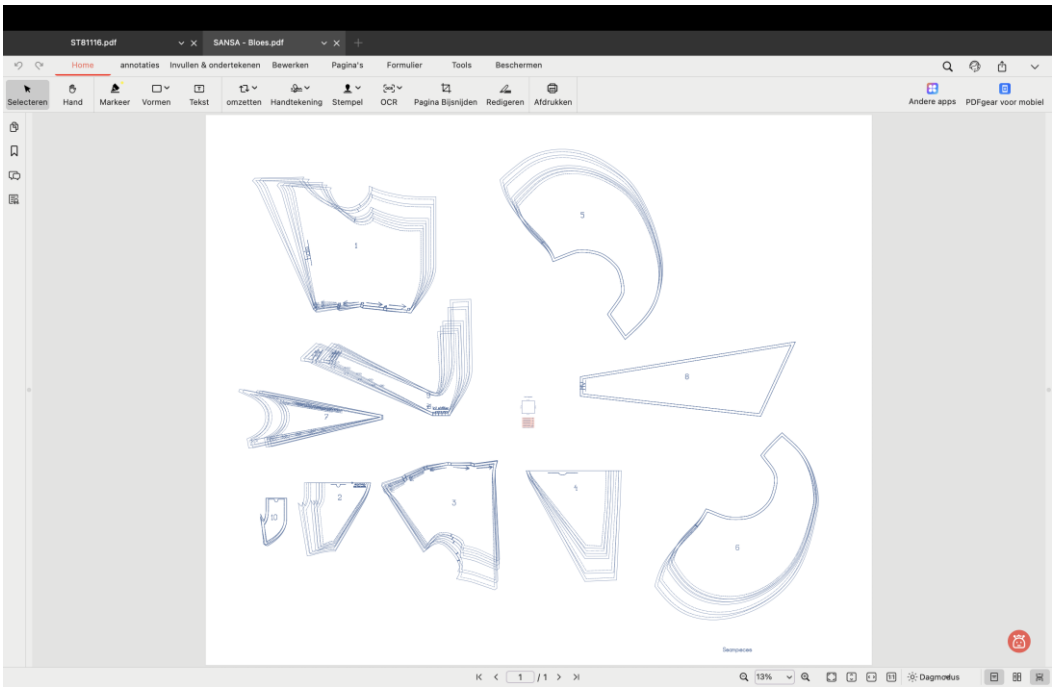


Figure 7: Sized pattern, based on the cycling ensembles blouse (ST81114A) named ‘Sansa’, by Fibre Mood

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maattabel Fibre Mood	XS		S		M		L		XL		XXL		XXXL		
	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
borstomtrek	76	80	84	88	92	96	100	104	110	116	122	128	134	140	146
tailleomtrek	66	68	70	74	78	82	84	88	94,5	101	107,5	114	120,5	127	133,5
heupomtrek	86	90	94	97	100	103	106	109	115	120	125	130	135	140	145

CM

maat	XS	S	M	L	XL	XXL	XXXL							
lengte	50	52	54	56	60	63	66	49,545	51,645	53,745	55,845	60,445	63,045	65,645
mouwlengte	125	127	129	131	134	138	141	124,925	126,75	128,69	130,655	134,115	137,715	141,49
borstomtrek	125	132	140	148	158	170	181	124,73	132,47	140,25	148,065	157,825	169,5	181,225
	0	0	0	0	0	0	0							

INCHES

maat	XS	S	M	L	XL	XXL	XXXL
lengte	19,69	20,47	21,26	22,05	23,62	24,80	25,98
mouwlengte	49,21	50,00	50,79	51,57	52,76	54,33	55,51
borstomtrek	49,21	51,97	55,12	58,27	62,20	66,93	71,26
	0,00	0,00	0,00	0,00	0,00	0,00	0,00

INCHES AFGEROND .1

maat	XS	S	M	L	XL	XXL	XXXL
lengte	19,7	20,5	21,3	22,1	23,7	24,9	26,0
mouwlengte	49,3	50,0	50,8	51,6	52,8	54,4	55,6
borstomtrek	49,3	52,0	55,2	58,3	62,3	67,0	71,3
	0,0	0,0	0,0	0,0	0,0	0,0	0,0

Figure 8: Fibre Mood Size chart for a blouse, based on ST81114AB



Figure 9: Replica 'Mildred' + paper pattern (created by Fibre Mood) on display in the MoMu shop.

2.2 Sport and Music: The Olympic Experience

2.2.1 Introduction Pilot 2

The pilot use case showcases the potential of the REEVALUATE framework in addressing the challenges associated with the digitisation of cultural heritage artefacts and their exploitation for sustainable CH management within the Creative Industries and particularly Advertising. The pilot involved the digitisation of selected artefacts from both institutions, including historical photographs, art pieces, and artefacts related to various cultures of the world and the Olympic Games. The digitisation process included appropriate copyright tagging and acquisition to ensure that the artefacts' copyrights are managed effectively. The collaboration explores the multifaceted relationship between the Olympic Games and music, spanning from antiquity to contemporary times. A multisensory experience will

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engage visitors to immerse themselves in the history, values, and cultural essence of the Olympic Games and the Olympic Movement, as sporting and cultural events that unite sports and music.

FFP incorporated materials from this partnership, highlighting the potential of digitised heritage material in contemporary advertising practices, focusing on leveraging digitised cultural heritage (CH) artefacts for creative and sustainable advertising within the Creative Industries and Advertising sectors. Building on this material, FFP is producing the proof-of-concept advertising film "Olympia", inspired by the five thematic units developed by the museums and the selected digitised artefacts; Section 2.2.7 reports the results. The pilot also included a series of interconnected activities, such as storytelling development, historical research, the compilation of an asset list for digitisation, and the execution of the digitisation process itself. The selected material encompasses historical photographs, musical pieces, and artefacts reflecting both diverse global cultures and the history of the Olympic Games, but the main objective is to test the enablers and the marketplace. Additional activities involved metadata review and enrichment.

The Olympic Museum of Thessaloniki selected and provided artefacts from its rich collections for digitisation, ensuring that the most significant symbols of Olympic history are represented. The museum's curators and historians actively contributed to the collaborative contextualisation of the digitised artefacts, working with citizens to co-create narratives that connect historical objects to contemporary values and lived experiences. They used their expertise in Olympic history to provide essential insights and interpretations that anchor the exhibition in authenticity and credibility. Additionally, they ensured that the DLT-based Asset Tokenisation & IPR Management Enabler was applied appropriately to manage the copyrights of the digitised artefacts. Beyond content, the Olympic Museum also acts as the physical stage, orchestrating the immersive design of the five rooms and shaping how visitors engage with the Olympic legacy in a dynamic, participatory manner.

The Media Department of the Ethnologisches Museum and Museum of Asian Art (SMB/SPK) provided a selection of digitised assets related to music and sports from its collections, suggested musical material for the planned immersive production on the Olympic Games for Thessaloniki and for a possible Berlin-based satellite pilot, which can showcase the results via a mobile exhibition in Berlin and disseminate them on tour during the dissemination phase still tentative. They participated in the testing of enablers (Public Sensing Prioritisation Enabler, AI-driven Contextualisation Enabler (text, image, audio), Collaboration Enabler, Context Validation Enabler, DLT-based Asset Tokenisation & IPR Management Enabler).

2.2.2 Enabler Integration Status

The following table summarises the integration status of the REEVALUATE enablers within Pilot 2 for the second pilot phase. Enabler descriptions are based on D4.1; status entries were updated with partner input collected during the preparation of this release (July 2026). Both the Olympic Museum of Thessaloniki (OLYMPIC) and the Ethnologisches Museum / Museum of Asian Art, Berlin (SMB/SPK) participated in the testing.

Enabler	Description (from D4.1)	Status	Responsible	Expected
Public Sensing Prioritisation Enabler	Interactive campaigns via social media to engage audiences interact through cultural heritage	Campaigns active on social media at both OLYMPIC and SMB (10 participants engaged)	LINKS (development), OLYMPIC / SMB (testing)	August 2026

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	assets of our institution and collection.			
Contextualisation Enabler	Enriches Olympic and music-related artefact metadata based on provided text and images, integrating contextual information into the REEVALUATE Knowledge Base to support exhibition design	In progress at both institutions; OLYMPIC uploading artefact list to Marketplace (available since 4 February), SMB in second testing phase	LINKS (development), OLYMPIC / SMB (testing)	OLYMPIC August 2026; SMB: 15 April 2026
Collaboration Enabler	Makes digitised artefacts available to FFP and others for creative reuse; supports multimodal search to discover and explore Olympic and music-related artefacts	The digitisation process in collaboration with 3DR has been concluded and the artefacts have been delivered to FFP for creative reuse. SMB/SPK in progress & working with the enabler.	KU Leuven (development), OLYMPIC / SMB (testing)	OLYMPIC: 3DR March 2026; FFP August 2026 ; SMB: 15 April 2026
DLT/IPR Management Enabler	Ensures compliance with copyright while using assets for productions in Pilot 2 Ensures appropriate copyright agreements are in place before creative reuse of artefacts through DLT-based asset tokenisation and smart contracts	OLYMPIC The enabler is implemented during/for the video production SMB received Marketplace access this week; enabler testing to follow	CERTH (development), OLYMPIC / SMB (testing)	August 2026
Context Validation Enabler	The enabler (integrated through marketplace) will be used to check and validate that the digitized artefacts have not been misused or used out of context with the video developed Validates that digitised artefact are not misused or taken out of context within the exhibition and video production; detects inappropriate content including violence, nudity, hate speech, crime scenes, and deep fakes	OLYMPIC The enabler is implemented during/for the video production; SPK tested it Not yet tested at pilot level	CERTH (development)	August 2026

2.2.3 Assets used

The objects selected for Pilot 2 from the Olympic Museum are artefacts from the main collection of the Olympic Museum of Thessaloniki, which comprises more than 10,000 exhibits of exceptional historical, cultural, and sentimental value. The selection was carefully curated to offer a representative overview of the Olympic Movement, presenting its history, ideals, evolution, and impact through a diverse range of objects. By highlighting different aspects of Olympism, sport, memory, and heritage, the selected artefacts aim to create a meaningful connection between the audience and the legacy of the Olympic Games. The selected assets are 23 (see below including historical documents, medals, cups, sport equipment and uniforms) and are used for the enablers' integration, the digitisation process, and the video production.

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The reference assets of the Olympic Museum are listed in Table 2; the sounds selected from the SMB/SPK archive (Table 3) are matched to the assets they accompany. SMB/SPK selected 25 audio recordings from the archive based on the following criteria: use of instrument types also employed at the ancient Olympic Games (flutes, trumpets, lyres, percussion); relevance to the assets selected by the Olympic Museum; ethically and legally sound provenance and straightforward clearance of usage rights for an exhibition in Thessaloniki and in the Berlin Satellite; and good documentation.

Table 2: Digitised artefacts of the Olympic Museum of Thessaloniki.

	Artefact	Description (Olympic Museum)
SM_RV_1	MEDAL "B" SECOND ZAPPIA OLYMPIA 1870	Commemorative medal of the second Zappeia Olympia which were held in 1870, in the renovated Panathenaic Stadium with 30,000 spectators, bearing witness to the early efforts to revive the Olympic spirit in Europe, long before the Olympic Games became the global event we know today. On the…
SM_RV_2	GOLD MEDAL STELIOS MYGIAKIS "MOSCOW 1980"	Gold medal awarded to the Olympic Champion Stelios Mygiakis in the 62 kg Greco-Roman wrestling category at the Moscow 1980 Olympic Games. On the obverse, the medal depicts the traditional figure of Nike, goddess of Victory, holding a palm branch in her left hand and a victor's crown in her…
SM_RV_3	PARTICIPATION COMMEMORATIVE MEDAL "ATHENS 1906"	Commemorative participation medal of the Athens 1906 Intercalated Games, marking the tenth anniversary of the revival of the modern Olympic Games and renewing global interest in the Olympic movement. On the obverse, the medal depicts the seated Allegory of Greece, holding a laurel wreath and a…
SM_RV_4	BRONZE MEDAL IOANNA HADZIIOANNOU "SYDNEY 2000"	Bronze medal awarded to Ioanna Hatziioannou in weightlifting at the Sydney 2000 Olympic Games. On the obverse, the medal bears the traditional figure of Nike, goddess of Victory, holding a palm branch in her left hand and a victor's crown in her right. For the Sydney 2000 Games, this figure is…
SM_RV_5	SILVER MEDAL ALEXANDROS NIKOLAIDIS "BEIJING 2008"	Silver medal awarded to Alexandros Nikolaidis, two-time Olympic silver medallist in taekwondo, from his participation in "Beijing 2008". For the first time in Olympic history, jade was incorporated into the design of the Olympic medals. The Beijing 2008 medals drew inspiration from the bi, an…
SM_RV_6	PARTICIPATION COMMEMORATIVE MEDAL "ATHENS 1896"	Commemorative participation medal of the Athens 1896 International Olympic Games, designed by Nikephoros Lytras and struck by W. Pittner in Vienna. On the obverse, the medal depicts the seated Allegory of Greece, holding a laurel wreath and a sceptre. Beside her, a phoenix rises from the ashes,…
SM_RV_7	HELLENIC NATIONAL TEAM ENSEMBLE "SYDNEY 2000" - Rhythmic Gymnastics Hoop	Signed rhythmic gymnastics hoop belonging to Chara Karyami, bronze Olympic medallist and member of the Greek National Group. The inscription "2000 CHARA KARYAMI" appears in gold lettering, followed by her signature.
SM_RV_8	HELLENIC NATIONAL TEAM ENSEMBLE "SYDNEY 2000" - Rhythmic Gymnastics Club	The bronze medal won by the Greek rhythmic gymnastics group at the Sydney 2000 Olympic Games was more than a sporting achievement. It remains the first and only Olympic medal ever won by Greece in rhythmic gymnastics. The Greek athletes had achieved a very high score in the qualification round,…
SM_RV_9	COMPETITION ARROW EVANGELIA PSARRA "LONDON 2012"	Competition arrow of Greek archer Evangelia Psarra from the London 2012 Olympic Games. The arrow bears the handwritten inscription "LONDON 12, HELLAS EV. PSARRA." Psarra has represented Greece in six consecutive Olympic Games, becoming one of the few archers in history to achieve this milestone.
SM_RV_10	COMPETITION EQUIPMENT SPYROS GIANNIOTIS "RIO 2016"	Competition swimming goggles belonging to Spyros Gianniotis, from his participation in the marathon swimming event at the Rio 2016 Olympic Games, where he won the silver medal. The goggles bear the athlete's signature.

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SM_RV_11	HELLENIC NATIONAL TEAM ENSEMBLE "SYDNEY 2000" - Rhythmic gymnastics ball	Rhythmic gymnastics ball signed by Olympian Eva Christodoulou, member of the Greek National Group that reached the podium and won the bronze medal at the Sydney 2000 Olympic Games.
SM_RV_12	OLYMPIC TORCH "BERLIN 1936"	For the first time in the history of the modern Olympic Games, the Ceremony for the Lighting of the Olympic Flame was held. The torch of the Berlin 1936 Olympic Games was designed by the sculptor Walter Lemcke. Made of steel, it featured a base designed to receive the wax used to sustain the…
SM_RV_13	COMPETITION SWORD DIMITRA MAGANOUDAKI "ATHENS 2004"	Dimitra Maganoudaki began fencing at the age of just eleven. At the Athens 2004 Olympic Games, she represented Greece in both the individual and team fencing events. Competition sword (épée) belongs to the athlete, from her participation in the women's individual épée event at the Athens 2004…
SM_RV_14	MARATHON CUP MESOLYMPIC/INTERCALATED GAMES "ATHENS 1906"	In addition to the medals awarded to the winners of the 1906 "Intercalated Games," ornate cups, crafted by distinguished sculptors, were presented to athletes across a range of events. The Cup of the Intercalated Games, Athens 1906, inspired by the form of the *kantharos*, an ancient Greek…
SM_RV_15	COMPETITION RACKET PANAGIOTIS GIONIS "RIO 2016"	Signed competition table tennis racket belonging to the athlete Panagiotis Gionis. The racket narates the story of one of Greece's most distinguished table tennis athletes. At the age of 44, Gionis qualified for the Paris 2024 Olympic Games, marking his sixth participation in the Olympic Games…
SM_RV_16	KOTINOS - OLIVE WREATH "ATHENS 2004"	Kotinos awarded to the Olympic gold medallist in judo, Ilias Iliadis, at the Athens 2004 Olympic Games, when the 18 years old Iliadis won the first medal for Greek judo in the history of the Olympic Games. The kotinos is a wreath made from a branch of wild olive, with which victors were crowned…
SM_RV_17	COMPETITION MASK DIMITRA MAGANOUDAKI "ATHENS 2004"	Competition fencing mask belonging to Dimitra Maganoudaki, from her participation in the team fencing event at the Athens 2004 Olympic Games, alongside Ioanna Christou, Panagiota Lionti and Niki Sidiropoulou. The Greek team finished in 8th place, leaving a strong mark on Greek fencing and…
SM_RV_18	COMPETITION SHOES MILTIADIS TENTOGLOU "TOKYO 2020"	Pair of competition shoes belonging to Miltiadis Tentoglou, two-time Olympic champion in the long jump at the Tokyo 2020 and Paris 2024 Olympic Games. The shoes are from his participation in the Tokyo 2020 Olympic Games, where he won the gold medal with a jump of 8.41 m. At the Paris 2024…
SM_RV_19	COMPETITION SHOES STELIOS MYGIAKIS "MOSCOW 1980"	Red, ankle-high wrestling competition shoes of the Olympic champion Stelios Mygiakis, from his participation in the Moscow 1980 Olympic Games, where he won the gold medal in the 62 kg Greco-Roman wrestling category, bringing Greece its first Olympic gold medal in twenty years.
SM_RV_20	COMPETITION GLOVE IOANNA BOUZIOU "ATHENS 2004"	Competition softball glove belonging to Olympian Ioanna Bouziou (7th place), from the Athens 2004 Olympic Games. On its outer side, it bears the handwritten markings "ATHENS 2004," "JO" and "26." Ioanna Bouziou was a member of the Greek National Softball Team that represented Greece at the…
SM_RV_21	COMPETITION BALL IOANNA BOUZIOU "ATHENS 2004"	Yellow competition softball bearing the Athens 2004 Olympic Games emblem, belonging to Olympian Ioanna Bouziou, from her participation in the Games, where she finished 7th with the Greek National Softball Team.
SM_RV_22	COMPETITION BELT NIKOLAOS ILIADIS "MONTREAL 1976"	Competition belt of the Greek weightlifter Nikolaos Iliadis at the 1976 Olympic Games in Montreal, where he took the fourth place. Iliadis is the only Greek weightlifter to have competed in four Olympic Games, marking a remarkable career and long-standing contribution to Greek Olympic history.
SM_RV_23	COMPETITION BALL OF HELLENIC NATIONAL WATER POLO TEAM "RIO 2016"	Competition water polo ball from the participation of the Greek men's national team in the Olympic Games 'Rio 2016'. It bears the signatures of all the team's players.

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Table 3: Audio recordings selected from the SMB/SPK archive.

Assets N°	How	When	Where	Nr.	What
SPK: Music! 111_VII_CD_1325-8					
1	*Phonograph*	*1912*	*China*	*1/8*	*Rowing song of a boat's crew on the Yangzi*
2	*Phonograph*	*1935*	*Ivory Coast*	*1/21*	*Kuadinkro bessueba (flute ensemble & singer)*
3	*Phonograph*	*1908*	*Cameroon*	*1/23*	*Music for the 'lela' celebration*
4	*Phonograph*	*1928*	*Sudan*	*1/27-28*	*Two songs of the Zande*
5	*Phonograph*	*1903*	*Tanga*	*1/29*	*Xylophone piece of the Bondei*
6	*Phonograph*	*1897*	*Columbia*	*1/30*	*Dance song of the Thompson River Indians*
7	*Phonograph*	*1909*	*Lithuania*	*1/38-39*	*Instrumental pieces (skuduciai ensemble)*
8	*Phonograph*	*1909*	*Lithuania*	*1/38-39*	*Skuduciai players (photo)*
9	*Tape*	*1956*	*Turkey*	*2/1*	*Instrumental narration (diidiik flute)*
10	*Tape*	*1955*	*Turkey*	*2/5-6*	*Uigur musicians (zihizga & dombra)*
11	*Tape*	*1955*	*Turkey*	*2/5-6*	*Uigur musicians (zihizga & dombra)*
12	*Tape*	*1955*	*Cairo*	*2/11-12*	*Mawwal and Nubian song*
13	*Tape*	*1962*	*N'guya*	*2/13*	*Song of harp player Kali (Buduma)*
14	*Tape*	*1958*	*Bolivia*	*2/22*	*Music for 'ayarichi' dance*
15	*DAT*	*2000*	*Myanmar/Burma*	*3/4*	*Praise song 'Pat pyo'*
16	*Tape*	*1958*	*Bolivia*	*3/8*	*Oceania, New Guinea, Dance Festival*
17	*Concert*	*1977*	*Berlin*	*4/7*	*Music of 'mizmar baladi' ensemble*
18	*Composition*	*2013*	*Berlin*	*5/3*	*52°46' North 13°29' East - Music For Wax-Cylinders (Ex-cerpt)*
Trumpets VII_CD_1675: Waza, Bal Naggaro, Abangaran Music of the Berta from the Blue Nile, Sudan					

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19	CD	1983	Sudan	8	Akharo (2:43)
20	CD	1983	Sudan	14	Bartha waiyo (6:07)
South Indian Tempel instruments VII_LP_5566, Josef Kuckertz Editor: Dieter Christensen 1969					
21	LP	1969	South India	B 17	Langstuba pânkà
22	LP	1969	South India	B 18	Längstuben napuri und pānkà
23	LP	1969	South India	B 22	Conch-shell trumpet sankha
24	LP	1969	South India	B 23	Conch-shell trumpet sankha
25	LP	1969	South India	B 24	Conch-shell trumpet sankha

The Contextualisation and Collaboration Enablers served a similar function at a later stage in the project. The Context Validation Enabler and the DLT/IPR Management Enabler will also be tested to ensure appropriate use of assets within the exhibition project.



Figure 10: Mood boards for Pilot 2



Figure 11: Screenshot of 3D model produced

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2.2.4 What are the challenges and approaches in terms of reuse

The Pilot 2 digitised artefacts were made available for creative reuse by FFP, which was tasked with developing a video clip utilising these artefacts, expressing its commitment to promoting respect and unity through sports and encouraging viewers to join in this mission.

Below are the potential risks associated with the reuse of artefacts, which were mitigated through the integration of the available enablers.

- Accurate copyright status and tagging: All artefacts carry an All Rights Reserved status. Action: The DLT-based Asset Tokenisation & IPR Management Enabler ensures that the appropriate copyright agreements are in place before the creative reuse of the artefacts, preventing any out-of-context use or misuse of the digitised material.
- Cultural sensitivity and misrepresentation: Artefacts tied to named athletes and historical events risk being presented in ways that misstate their significance. Action: The Olympic Museum's curators reviewed the narrative and the selection of artefacts, and every visual claim in the film is anchored to the museum's own artefact descriptions and curatorial documentation.
- Recontextualization risks: Placing artefacts in a new advertising narrative can detach them from their historical context. Action: The Context Validation Enabler is used to check that the digitised artefacts are not misused or taken out of context within the film, and the five thematic units elaborated by the Olympic Museum serve as the narrative frame that keeps the reuse anchored to the curatorial concept.
- Inconsistent metadata: Divergent metadata between the two collections could lead to incorrect attribution or pairing of assets. Action: Metadata review and enrichment was carried out as part of the pilot activities, and the AI-driven Contextualisation Enabler integrates the corrected contextual information into the REEVALUATE Knowledge Base.
- Balancing creative freedom with curatorial integrity: The creative treatment must serve the advertising purpose without overriding curatorial standards. Action: The film was developed with reference to the thematic units and reviewed with the museum; where the historical record does not specify a visual detail, the treatment leaves it unshown rather than inventing it.

The Context Validation Enabler will be used to check and validate that the digitised artefacts are not misused or used out of context within the video clip developed.

2.2.5 What are the challenges and approaches in terms of reuse for music

Museums are often geared towards the visual (e.g., photos of collected objects) and existing infrastructure is often not specialised for sound, audio, or video. Today, museums generally — not only collections specialised in music — have an interest in using images as well as audio and video to contextualise the objects in their collections. In other words: while music collections have an evident need to employ audio and video in addition to photos of musical instruments, these media are also useful for material culture collections not focusing on music. Copyright legislation is theoretically independent of the medium (music, photo, painting, etc.), but de facto and in practice, jurisdiction in the music/audio domain does not always follow the conventions in other domains such as photography. This makes music and audio licensing often unfamiliar, especially in the museum world, and requires specialised expertise. Hence, negotiations over licensing often take a long time. Example: the last change

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to German copyright law simplified the reuse of photos of objects which are in the digital domain and now are almost automatically also in the public domain. Similar simplifications do not exist for the audio/music domain in Germany. Data protection laws and the rights of personality pose similar challenges and constraints.

SMB/SPK represents the ethnographic collection which faces additional ethical constraints. Some of their collections were acquired under colonial or quasi-colonial circumstances and hence their reuse is often subject to additional ethical constraints. Ideally, most reuse should be cleared for appropriateness with the communities of origin, which is extremely labour-intensive. For the Berlin satellite, musical examples from our collection were selected with specific regard to these issues. In this way, concrete challenges are illustrated through examples and can be addressed to clarify the issues, discuss them, and propose ways of handling them.

2.2.6 Deviation from Proposal

The REEVALUATE proposal originally foresaw the production of one advertising video within Pilot 2. To test the REEVALUATE enablers in a more practical and realistic museum environment, the Olympic Museum of Thessaloniki is preparing an immersive exhibition under the working title "The Olympic Experience" (planned opening November 2026), which provides the real-world setting for the pilot. The Museum contributes the exhibition space, projection equipment and further services in addition to the REEVALUATE project funds and orchestrates the curatorial design of its five thematic units. FFP's committed contribution, as foreseen in the Grant Agreement and confirmed in D4.8, remains the production of one proof-of-concept advertising film ("Olympia"). The film demonstrates how digitised cultural heritage assets from the REEVALUATE marketplace, drawn from the collections of both participating museums, can be selected and integrated into a single audiovisual narrative; it is developed with reference to the five thematic units elaborated by the Olympic Museum. As a proof of concept, the film demonstrates one possible form of collaboration using the enablers. A fully specified production with partner-defined creative direction and successive rounds of revision would represent a more extensive undertaking beyond the scope of the proof of concept and the person-months available. Further elements, such as additional thematic videos or a projection-based presentation of the film within the exhibition spaces, remain potential enhancements. Any additional material beyond that scope is delivered only if person-months allow and is not guaranteed. Finally, the narrative focus evolved from the originally envisaged athlete-centred concept towards the broader cultural and historical significance of the Olympic Games alongside the visual artefacts from the Olympic Museum of Thessaloniki. The production plan follows the scope set out in the proposal.

2.2.7 Results from the 2nd pilot phase - Advertising film “Olympia”

The second phase of Pilot 2 began in August 2026. The difficulties and technical issues identified during the first phase were addressed in its preparation, and the functionalities of the individual tools and enablers have been further improved; the first iteration's insights and practical feedback directly shaped the production approach reported below.

Regarding film production, the five thematic areas were developed by the Olympic Museum of Thessaloniki. These areas offer a rich curatorial narrative covering a broad historical span from antiquity to the present day. From Berlin, SPK contributed a vast collection of music from around the world and linked it thematically to the content. Together, they provide an extensive and well-researched body of material from which the most appropriate scenes are selected and adapted to produce the proof-

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of-concept advertising film. In this way, the demonstration of the reuse potential of digitised cultural heritage is grounded in engaging, meaningful, and historically rigorous content.

From the digitised material, FFP developed the film's narrative around the five thematic units, centring the first completed scenes on the most symbolically dense artefact of the collection: the Kotinos, the olive wreath of the Athens 2004 Games (SM_RV_16). Production follows an AI-assisted pipeline in which the digitised artefacts serve as visual ground truth: each scene is developed from a sourced shot-list in which every visual claim is anchored to the museum's artefact documentation and the historical record and details the record does not specify are deliberately left unshown rather than invented. The production workflow itself - including the role of the open-source Empirica framework and the per-scene certificates of provenance - is described in Section 3.7

As a first-look result, two complete scenes have been produced: "The Cutting of the Wreath", a four-shot sequence of approximately sixteen seconds depicting the sacred olive tree at Olympia and the cutting of the branch, and "The Crowning", a twenty-second sequence depicting the wreath bestowed on the victor. Both scenes reuse the digitised Kotinos as their central visual element, each ships with a machine-generated certificate of provenance stating what the scene asserts and what it deliberately does not, and both are delivered with edit-ready project files for final assembly. A working trailer assembly of approximately fifty seconds organises the material into five beats, one per thematic unit, integrating the SMB/SPK recordings as the film's sound world; further scenes, each built around another artefact of the collection, are in production.

As specified in the KPIs, visitor attendance, on-site feedback and the impact of the exhibition will be measured through wider indicators of engagement and dissemination. Participant interaction and feedback will be evaluated via social media activity, campaigns, online questionnaires, and forms, as well as through responses to press releases and newsletters. These channels provide insight into the resonance of the exhibition beyond the physical museum space. Collaboration agreements and documented partnership reports will serve as evidence of institutional impact and the strengthening of networks around the exhibition. Feedback and evaluation will be gathered not only from visitors but also from participants and stakeholders, using both online and face-to-face surveys. The dissemination process will be further assessed by monitoring media coverage, including press mentions, press releases, and newsletters. Taken together, these measures — visitor numbers, social media engagement, partnerships, stakeholder feedback, and media presence — provide a multidimensional picture of the enablers' success in a realistic workflow across two cultural heritage institutions. They ensure that the impact is understood not merely in terms of attendance, but also in its cultural reach, public engagement, and contribution to the international dialogue on Olympic heritage.

2.3 Pilot 3 – Historic Location of Aquileia

2.3.1 Introduction

This pilot case showcases the potential of the REEVALUATE framework in empowering a small community with strong connections and bonds to its cultural heritage to take an active role in the management of their CH digitisation and reuse. The third pilot involves Fondazione Aquileia as the cultural heritage partner and 3D Research (3DR) as the technical partner, and centres on the ancient city of Aquileia — continuously inhabited since 181 BC and of exceptional archaeological significance. Unlike the first two pilots, which reuse digitised artefacts in new presentation contexts, Pilot 3 presents digital artefacts within the physical environment of the historic location itself: site-level digitisation of the Titus Macer Domus and selected artefacts from the National Archaeological Museum of Aquileia are combined into an interactive virtual tour, accessible both on-site and remotely, enriching the visitor

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experience with contextual information that connects the physical remains to their historical significance.

At the centre of the pilot stands the House of Titus Macer, a Roman domus built in the first century BC and inhabited continuously until the sixth century AD. Partially investigated in the 1950s, the residence was excavated between 2009 and 2015 by the Department of Cultural Heritage of the University of Padua, in agreement with Fondazione Aquileia; the attribution to Titus Macer, a wealthy inhabitant of the city, rests on the discovery of a stone weight with an iron handle bearing the inscription T.MACR. The digitised assets anchored to the domus include this stone weight and a sestertius found on the premises, both now preserved in the National Archaeological Museum of Aquileia, as well as a stone brick oven, a stone wellhead, and a polychrome mosaic with a fawn and a dog, all still located within the domus. The National Archaeological Museum further identified a set of macro-classes of objects from which additional items were selected, bringing the total number of digitised artefacts for the pilot to 24.

The participatory dimension distinguishes this pilot. By December 2025, young students living in Aquileia had taken part in a prioritisation campaign through the Public Sensing Prioritisation Enabler, expressing which Roman artefacts most interested them and why; their preferences guided the digitisation priorities. In the contextualisation phase, two archaeologists and three university professors provided expert content for the digitised artefacts, and the second pilot phase extends this to the staff and experts of the Archaeological Museum and to students of the Universities of Udine and Padua. The pilot thereby also serves the educational mission of the site: through EducA, the joint educational department of the UNESCO site of Aquileia, the resulting virtual tour is embedded in learning activities for schools. The sections below report the enabler integration status, the specific challenges of digitising a heritage site as opposed to individual artefacts, and the results of the second pilot phase.

2.3.2 Enabler Integration Status

The following table summarises the current integration status of the REEVALUATE enablers within Pilot 3. Enabler descriptions are based on D4.1; status updates reflect partner input as of July 2026. Notably, the Public Sensing campaign has been completed with 96 participants, and 3DR's virtual tour of the Titus Macer Domus has been completed (see Section 2.3.4).

Enabler	Description (from D4.1)	Status	Responsible	Expected
Public Sensing Prioritisation Enabler	Promotes active engagement of the public in the prioritisation of cultural heritage artefacts for digitisation; young students living in Aquileia participate in the selection of assets to be digitised, ensuring diverse voices and perspectives are heard	Complete; 96 participants engaged in asset selection campaign	LINKS (development), Fondazione Aquileia (testing)	Complete
Contextualisation Enabler	Combines storytelling and 3D content creation to engage different publics with the heritage of Aquileia; professional stakeholders (archaeologists, historians, experts) contribute contextual knowledge integrated into the REEVALUATE Knowledge Base	In progress; stakeholder engagement ongoing	LINKS (development), Fondazione Aquileia (testing)	September 2026

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Context Validation Enabler	Verifies that contextualisation content produced for the virtual tour is correct, consistent, and scientifically acceptable; assesses appropriate use of context through automated validation	Not yet started	CERTH (development), Fondazione Aquileia (testing)	September 2026
DLT/IPR Management Enabler	Ensures appropriate copyright agreements are in place between Fondazione Aquileia and 3DR before creative reuse of digitised artefacts through DLT-based asset tokenisation and smart contracts	Not yet started	CERTH (development), Fondazione Aquileia (testing)	September 2026



Figure 12: Aquileia aerial picture

2.3.3 Location vs. Artifacts incl. Challenges for Reuse

When choosing between a site and an artefact for digitisation, the main differences lie in scale, context, and the type of digital assets produced, which in turn introduce distinct challenges. Both are important to allow a fully immersive experience for visitors. Selecting a site or an artefact depends mainly on the project goals and the intended use of the digital assets. Choosing a site means prioritising contextual value and public engagement. A site is often selected when the aim is interpretation, accessibility, or storytelling at a territorial scale, for example, to support virtual visits, on-site interpretation, or landscape analysis. The challenge of this choice lies in managing complexity: higher costs, longer acquisition times, multidisciplinary workflows, and the need to balance accuracy with usability due to very large datasets. An artefact, instead, reflects a focus on precision, research, and conservation. Artefacts are often preferred when resources are limited or when the goal is detailed analysis, monitoring of conservation state, or scholarly comparison. The challenge here is deciding the appropriate level of detail: higher resolution increases scientific value but also impacts data size, processing time, and long-term sustainability. An artefact is a discrete and self-contained object with visible and tangible dimensions. Its digitisation can usually be carried out in controlled conditions, allowing for higher precision and repeatability. The main challenge is capturing fine geometric details, surface texture, and material qualities accurately. The digitisation process can be carried out by setting up a well-

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organised environment, placing lights, diffusers, and instruments for measuring and colour recording. Resulting digital assets are generally more focused and homogeneous, such as high-resolution 3D models, detailed textures, and documentation useful for conservation, analysis, and comparison, and can be optimised in terms of resulting mesh and visual properties. A site is inherently complex and extensive. It includes multiple elements, stratigraphic relationships, and a strong connection with the surrounding landscape. Digitising a site, therefore, means dealing with large areas comprising modern and ancient buildings, vegetation, and variable environmental conditions such as light, weather, and accessibility, all of which generate heterogeneous data. The challenge is not only technical but also conceptual: the digital representation must preserve spatial relationships and convey the historical and environmental context. The metrology is relevant to the right representation of the environment, considering that the resulting experience should simulate the real-life size of the buildings in order to give visitors a more realistic exploration. Digitising an outdoor environment means collecting heterogeneous datasets from multiple sources and instruments, which must be homogenised, integrated with georeferencing and spatial measurements, and processed using greater computational resources. As a result, site digitisation typically produces large and diverse digital assets, such as territorial 3D models, orthophotos, DEMs, GIS layers, and interactive or narrative virtual tours. Digital assets derived from a site are highly reusable across interpretative and educational contexts. The same datasets can support virtual tours, on-site digital mediation, landscape analysis, planning, and comparative studies over time. However, their reuse is often constrained by scale and specificity: site models are tightly linked to a location and usually need simplification or repurposing to be reused effectively on different platforms or for different audiences. Artefacts, on the other hand, tend to be more modular and flexible: high-quality 3D models of objects can be reused in exhibitions, catalogues, academic research, gaming, replicas (including 3D printing), and digital storytelling across multiple contexts.

2.3.4 Results from the 2nd pilot phase - Aquileia virtual tour

The application of the Human-Driven Contextualisation Enabler (HDCE) within Pilot 3 provides concrete evidence of how this multi-stakeholder contextualisation approach translates into measurable outcomes. The collaborative contextualisation and prioritisation process engaged 106 participants and interactions, resulting in 5 digitised artefacts made accessible through the repository during the first-round campaign, which in turn attracted 8,975 visitors and generated 274 interactions with the published content. These figures are further complemented by the results presented in D4.5, which reports 44 expert contextualisation contributions and 20 digital assets, together with one archaeological area, supporting the development of the virtual tour of Titus Macer's Domus. Taken together, these outputs demonstrate that public participation, expert knowledge and digitised assets can be effectively combined into a coherent contextual digital experience pathway, validating the human-driven contextualisation model at pilot scale.

Pilot 3 is particularly relevant for exploitation follow-up, as it points towards a replicable contextual digital experience package with strong potential for tourism-oriented heritage applications. Partner feedback confirms that the prioritisation campaign was successfully concluded, while the human-driven contextualisation campaign is set to continue into the next round. On this basis, Round 2 activities should prioritise user experience, the perceived value of enriched contextual content, user trust, and the repeatability of the virtual-tour workflow, to consolidate the model for broader deployment beyond the pilot phase. Pilot 3 results are anchored on the virtual tour of Titus Macer's Domus, which brings together digitisation outcomes, community contextualisation and measurable engagement into a single coherent experience. On the digitisation side, as reported in D2.4, the Domus was documented through a site-specific workflow combining drone-based aerial mapping,

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close-range photogrammetry and, for the associated finds held at the National Archaeological Museum of Aquileia, handheld 3D scanning and high-quality digital photography. This process yielded 27 digital objects overall, including the general archaeological area and three individually delivered elements (the mosaic, the oven and the stone well), alongside key finds such as a sestertius and a stone weight bearing an inscription. All assets were processed for texture and metric quality, colour-calibrated, and delivered in GLB format to ensure compatibility with the immersive presentation. In terms of usage indicators, the server's analytics capabilities make it possible to track how many users access and interact with the virtual tour once published, for example by monitoring the number of unique visitors to the tour, and the frequency and duration of visits over time. These usage metrics provide a quantitative basis for assessing the reach and engagement of the virtual tour and for guiding its refinement in the next round of activities, according to KPIs.

3 Reuse Applications and Production

3.1 3D asset production and digitisation methods

During the initial phases, a mapping of CHIs was carried out for the collection of a set of representative assets to be used as a showcase and for the initial testing and mapping phase. Three diverse domains were identified: fashion heritage, Olympic and ethnographic collections, and Roman archaeology. A comparative analysis of all selected objects allowed for mapping recurring metadata fields and establishing a harmonised structure suitable for integration within the REEVALUATE platform, emphasising the relevance and the needs for each collection. More precisely, the results showed that five objects from each pilot were collected and stored in the shared project working platform.

	Pilot 1	Pilot 2	Pilot 3
Type of objects	*Dresses, clothes and digital patterns*	*Museum objects and audio tracks*	*Archaeological finds*
Domain	*Historical Fashion Heritage*	*Cultures in Olympic Games and music*	*Archaeology*
Collection	*Already digitised and metadated*	*Already digitised and to be digitised*	*To be digitised*
Final Format File	*Images and patterns (pattern pilot), 3D models, text.*	*Images, 3D models, audio tracks*	*3D models, images*
Metadata associated	*objetname, material, ID, location, description, technical spec., contextual information*	*Description, material, category, technical spec., condition, date*	*Material, historical context, provenance, comparison with similar objects, aim*

Table 4. General classification of the three Pilots.

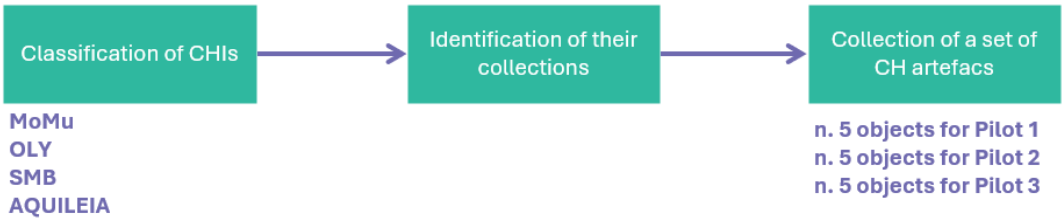


Figure 13. Mapping of activities carried out for D2.1.R1.

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Each object comes with a representative image and a description, or a metadata profile provided by the CHIs and rearranged in a spreadsheet. It was possible to systematically group and analyse the information related to the cultural artefacts that each partner intended to share for the REEVALUATE project. The shared objects, though differing in typology, format, and thematic focus, were analysed across several dimensions: type of media, available metadata, available descriptions and categorisation, domain, and intended use within the project. The multimedia diversity enables the project to address both tangible and intangible heritage dimensions. In the figure below, the collected representative set of objects is shown from all the Pilots. Each image (or object) is accompanied by a description and the general information about the related cultural asset. Considering the nature of the artefacts, several digitising techniques were investigated. Generally, the digitisation of Cultural Heritage encompasses a multidisciplinary suite of techniques and methodologies aimed at the accurate documentation for precise monitoring of geometries and textures. For objects analysed within CHIs' collections, two main distinctions were identified:

Digital capture that relies on high-resolution 2D recording, such as digital photography, which enables the precise recording of complex superficial patterns and colour fidelity; and a combination of metrological-grade 3D scanning workflows to generate accurate virtual models of three-dimensional objects. The instrumentation and the workflow can vary with object compositions, for example using LiDAR scanning and unmanned aerial vehicle (UAV) for archaeological areas, or photogrammetry by camera and 3D scanners for single objects.

Looking at the materials selected by each Pilot, a precise mapping of instruments and techniques was identified. The most common process involves the setup of a scanning technique with several measurements and recordings taken via support instrumentation.

3.1.1 2D digitising

A scientific imaging workflow requires multiple coordinated elements to accurately represent an object without distortions or colour shifts. Setting up a photographic digitisation station involves carefully planning the lighting, camera equipment, positioning, and environmental conditions to obtain high-quality, consistent, and repeatable results. This typically includes using a digital single-lens reflex (DSLR) or mirrorless camera with a precision lens, mounted on a stable tripod or copy stand to maintain identical framing. Lighting is fundamental: a controlled, diffused setup — usually achieved with continuous LED panels or studio strobes paired with soft boxes or diffusers — helps eliminate reflections, shadows, and hotspots. A neutral, non-reflective background further prevents colour contamination. Camera settings are fine-tuned for optimal quality, relying on low ISO, a suitable aperture for the required depth of field, and manual focus to ensure maximum sharpness. Capturing images in RAW format preserves full detail and enables accurate colour and exposure corrections during post-processing.

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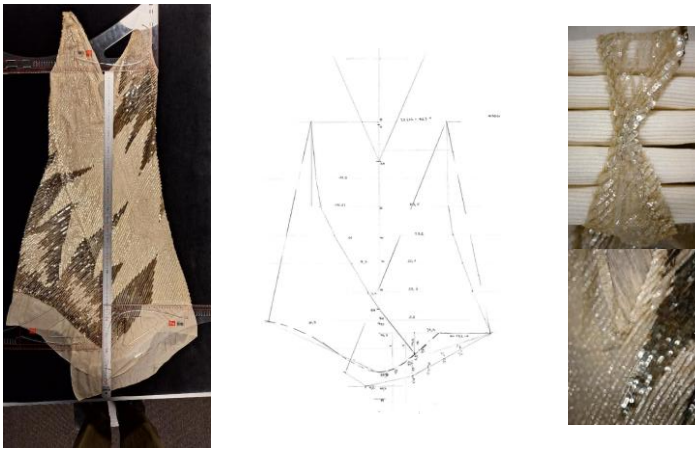


Figure 14. Test on the Digital Objects n. 1 (ST2202). On left: measurement and overall recording of the dress. On center: digitised pattern. On right: details acquired[21].



[21] Source: http://data.momu.be/ark:34546/mn0318

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Resource ID	Access	Contributed By
71231	Open	Stany Dederen

GENERAL

Publisher	Category	Source Material Type	Inventory	Creator	Artwork Date	External note	Color or b/w
MOMU	MOMU, MOMU/Studiecollectie, MOMU/Studiecollectie/Objectfoto	Original digital capture of a real life scene	ST659/1AB	Stany Dederen	1948 / 1957	Voor meer info en beeldmateriaal, surf naar https://commons.wikimedia.org/wiki/File:Mantelpak_(ST659_1AB_01)_-_Kostuum_-_MoMu_Antwerp.jpg	Color

COPYRIGHT

License	Copyright Owner	Copyright notice	Credit
CC BY	Stany Dederen	© Stany Dederen	© Collectie Modemuseum Antwerpen, schenking Frieda Dauphin-Verhees, foto Stany Dederen

TECHNICAL DATA

Creator tool	File format	File size	Original time & date	Original filename	MD5 checksum	Camera make/model
Capture One 10 Macintosh	TIFF at different resolution	8,5 MB 2401 x 3543 px (maximum)	05 December 17 @ 16:16	0412201741619.tif	c1b3421791b16ae3fb3bdc807e07789d	Credo 40

TMS INFO

TMS object ID	TMS object name	TMS Description	TMS dated	TMS medium	TMS classification
54636	mantelpak / jacket	Black coat suit. A. Jacket in black wool, closing with plastic buttons in the centre front, with accents of black fabric with interwoven block pattern. Made of this are the small shawl collar, pocket turn-ups, sleeve cuffs and two flaps at neckline level (optical ends of a scarf or tie). The slanted side pockets are partially incorporated into a seam and emphasise the shape of the hips. No lining. B. Black wool calf-length skirt with waistband, at the back at the bottom there are two pleats turned inwards. Closes with press-studs.	1948-1957	wool; plastic; synthetic fibre; fabric; metal	

REF LINK

https://heron.libis.be/momu/s/studiecollectie/item/mjdft0 https://museumstichting.resourcespace.com/pages/view.php?ref=71231&k=6dfbbb4b8f

EXTRA INFO

current permanent location	department
LZ.UNIT.90	Studiecollectie

Figure 15. Object ST659-1AB.22

Contacts	Place	Date	Dimensions	Condition	WEIGHT
Olympic Museum Collection	ATHENS	1906	31 x25 cm	GOOD CONDITION	911 gr





Figure 16. Object OM-00000061.[23]

ID No.	Prev. No.	Categ.	Description	Perm. position	Material	Collection of Works

[22] Source: Studiecollectie website – Pilot (http://data.momu.be/ark:34546/mjdft0).
[23] Source: Olympic Museum Thessaloniki.

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OM-00000061	0865 Σ072Aii	CUP	Cup awarded as a prize in the Marathon Race of the "Athens 1906" Intercalated Games. Front view inscription "INTERNATIONAL OLYMPIC GAMES IN ATHENS 1906". Back view inscription "ENTHYMEMA MARATHONIOU" (SOUVENIR OF THE MARATHON RUN) The Cup – Marathon Race Commemorative was a key document of the Exhibition: "Olympism. A Modern Invention, an Ancient Heritage" (24.04 – 16.09.2024) implemented by the Louvre Museum in collaboration with the French School of Athens in the framework of the Olympic and Paralympic Games "Paris 2024".	Permanent Exhibition 1900 – 1956	made of a base metal binary alloy Cu-Zn, known as brass, with an amalgam of silver (Ag) and mercury (Hg) to its surface to give the silver appearance	ARTEFACT, EXHIBIT





Materials	Aim	Comparison with similar "objects" of other areas outside Aquileia	Picture rights
Stone	Rainwater collection for the domus	The wellheads in Roman world are very different from each other, but the general shape is functionally the same	©FondazioneAquileia/Ikon/Nudesign for the 3D reconstruction ©A. Buldrin for the second image

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			©G. Baronchelli for the third image

3.1.2 Photogrammetry and digital photography

The setup relies on a calibrated digital imaging system, either a dedicated photogrammetric camera or a high-resolution DSLR/mirrorless camera, operating in a controlled environment with uniform, diffuse lighting to prevent harsh shadows, reflections, and uneven illumination. The object is photographed from multiple overlapping viewpoints, typically maintaining 60–80% overlap between consecutive images to ensure reliable feature detection and matching during 3D reconstruction. For small or medium-sized objects, a motorised turntable or a tripod-mounted camera rig can be used to standardise the capture workflow, while larger artefacts, architectural elements, or archaeological contexts may require handheld or pole-mounted photography to achieve full coverage. A structured acquisition plan is essential: consistent camera-to-object distance, stable exposure, and careful coverage of occluded or complex geometry significantly improve reconstruction accuracy. Depending on the project, colour calibration charts and scale bars may also be introduced to ensure metric integrity and faithful colour reproduction. The captured dataset is then processed through a dedicated photogrammetry pipeline using Structure-from-Motion (SfM) and Multi-View Stereo (MVS) algorithms to produce a sparse point cloud, a dense 3D point cloud, and subsequently a textured mesh or high-resolution orthophoto. Advanced workflows may include mesh optimisation, PBR texture generation, reflectance transformations, or integration with GIS/CAD systems to support documentation, analysis, or digital conservation tasks.

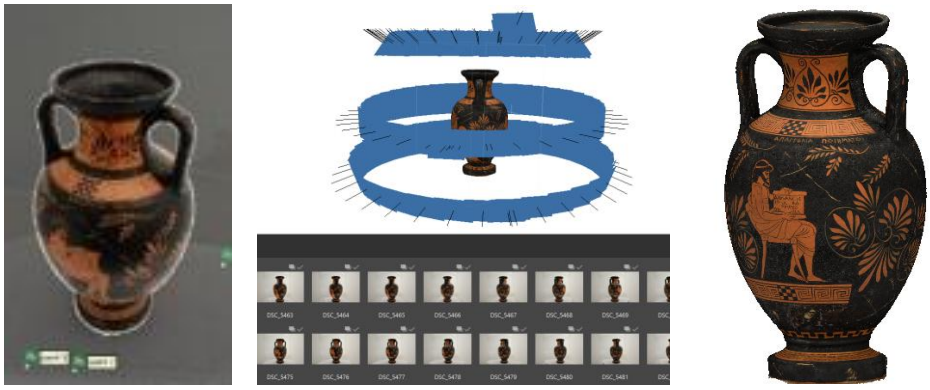


Figure 17. 3D digitising of a vase by photogrammetry during a previous activity by 3DR

3.1.3 Structured Light Scanner

For small to medium-sized objects, structured light scanning requires the careful configuration of both hardware and software components to generate precise, high-resolution 3D models. The core setup consists of a structured-light projector paired with one or more high-resolution cameras. During acquisition, the projector casts a sequence of coded or phase-shifted patterns onto the object, while the cameras record how these patterns deform across the surface. By analysing these deformations, the system reconstructs highly accurate 3D geometry through triangulation. The scanner can be mounted on adjustable stands to maintain stability, though in many workflows an operator manually positions the device to ensure full coverage. For larger artefacts or objects with complex geometry, multiple scans must be taken from several angles. These individual scans are then aligned, registered, and merged within dedicated post-processing software to create a seamless and watertight 3D model.

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Additional steps — such as noise reduction, mesh optimisation, texture mapping, and metric verification — may be performed to enhance the final dataset for archival, analytical, or visualisation purposes.



Figure 18. 3D Light structured scanner by Artec 3D (on left); example of digitising of a statue (on right).

After digitising, datasets are processed following a common workflow. In detail, the process required:

- Filter and align scans to obtain a single model from multiple sources.
- Process and optimise the scans and the aligned data in terms of geometry and details.
- Fix minor superficial and structural problems such as small holes.
- Prepare for the delivery of a ready-to-use 3D model in GLB format.

Several file formats can be used to deliver 3D models, each with its own strengths depending on the intended use. OBJ is one of the most established formats, widely supported across 3D software. It stores geometry, UVs, and basic materials, but requires multiple files (OBJ + MTL + textures) and does not support modern PBR materials. PLY is commonly used in scientific and research workflows, especially in 3D scanning; it efficiently stores geometry and vertex-based colour, making it suitable for detailed datasets but less ideal for animation or advanced rendering. FBX, developed by Autodesk, is the standard for animation, rigging, and game development pipelines. It supports a wide range of data, from meshes to animations and cameras, but can be heavy, complex, and inconsistent between software. In contrast, GLB/GLTF has emerged as the modern standard for distribution and visualisation. Designed by the Khronos Group, it integrates geometry, textures, and PBR materials in a single compact file. It is optimised for web, mobile, XR, and real-time applications, offering quick loading, high compatibility, and efficient performance.

Considering the output from all three Pilots and the need to store the files simply and compactly, the preferred structure can match the need to manage a single file for each cultural asset in a one-to-one relationship. This also avoids complexity in the storage and the recalling of the digital objects via the knowledge graph or other pointing systems that use the asset for running, for example, the experience.

Starting from the assumption that GLB is also a binary representation of GLTF, and therefore a more compact and efficient storage system (also called the "JPEG of 3D"), the delivery format chosen for

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assets is GLB. For most general-use cases, especially online display or interactive experiences, GLB is the most suitable choice.

3.2 3D asset production and digitisation methods

Building on the general digitisation techniques outlined in Section 3.1 and already presented in Deliverable D2.4 “Identification & digitisation of cultural heritage artefacts for the use during pilot phase”, this section details how each pilot translated those methods into concrete asset production workflows tailored to its specific cultural heritage domain. While the underlying acquisition techniques, such as 2D digitising, photogrammetry, and structured light scanning, are shared across the project, the resulting production pipelines differ significantly depending on the nature of the source material: garments and paper patterns for Pilot 1, discrete museum objects and audio material for Pilot 2, and both single artefacts and an extensive archaeological site for Pilot 3.

3.2.1 3D asset production and digitisation methods Pilot 1

The workflow for the creation of the assets to be used during the Pilot execution is a 'reverse engineering' pipeline that starts with the selection of digital objects as images of clothes and their patterns. The pattern is first made on paper and traces the different parts of which a garment is composed. Digitisation of these patterns requires two steps: scanning the paper pattern, which creates a raster/pixelated image (e.g., a JPEG); and consequently, vectorising the image (tracing the pattern image), which results in a scalable vectorised format (e.g., SVG) that can be uploaded in design applications. This means that a 2D representation can be used for a successive 3D representation through proper 3D design software, such as CLO3D (http://www.clo3d.com), that allows designers to create, visualise, and simulate garments in a virtual environment. Enabling realistic garment draping, pattern design, and fitting on customisable avatars, it helps streamline the apparel design process from concept to production. Widely used in the fashion and apparel industries, the software CLO3D reduces the need for physical samples, saving time and materials. Patterns become three-dimensional, texturizable models ready for deployment to virtual products. This reverse-engineering approach — reconstructing the garment's two-dimensional pattern on paper, digitising and vectorising it, and

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converting it into a 3D textured model — is specific to the fashion pilot, complementing the photogrammetry- and scanning-based methods used for the rigid artefacts of Pilots 2 and 3.

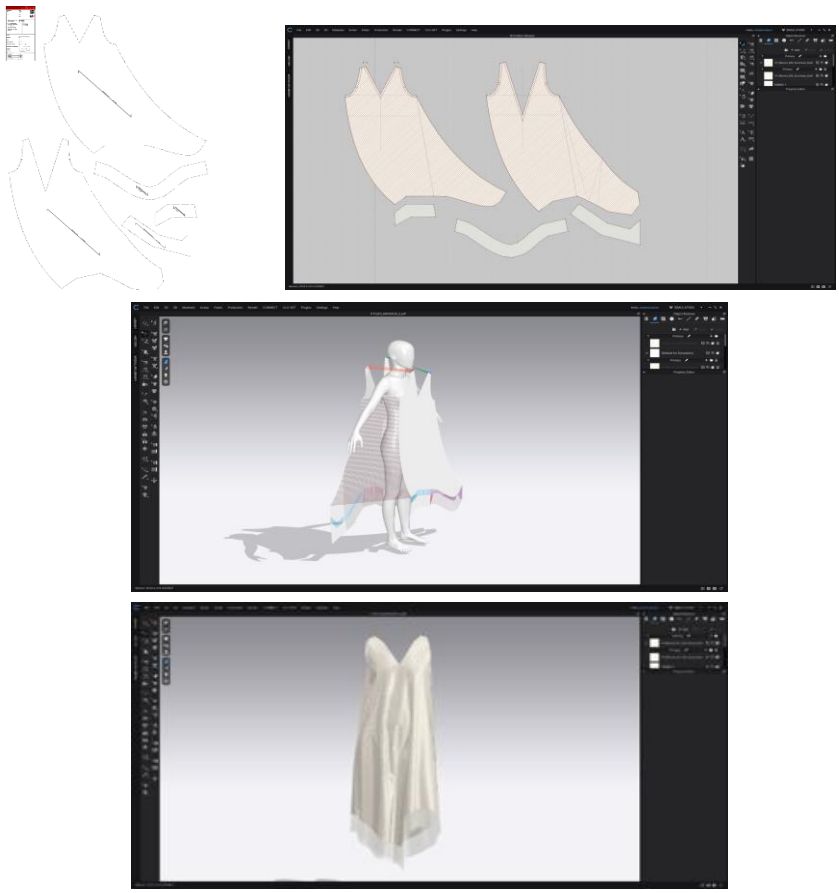


Figure 19. Test on the Digital Objects n. 1 (ST2202). Top left: digital pattern of the dress. Top right: pattern upload in CLO3D. Middle: creation of a 3D model. Bottom: 3D textured model[24].

The general workflow followed is as follows:

- Selection of the relevant garment to be digitised (with pilot partners)
- Creation of the 2D pattern on paper.
- Digitisation (and vectorisation) of the paper pattern.
- Conversion from 2D pattern to 3D textured model.
- Polycount suitability for performance in virtual environments.
- Lighting, shading, texture resolution, and size compatibility.
- Rigging and skeletal structures (if applicable);
- Standardisation and export in neutral formats (e.g., FBX, GLB, OBJ).
- Deliverable of the file and assessment & recommendation document outlining findings and next steps for further development.

[24] Source: http://data.momu.be/ark:34546/mn0318

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3.2.2 3D asset production and digitisation methods Pilot 2

Assets were produced for Pilot 2 and reflect the aim of the experiences developed, involving a complete set of objects from the Olympic Museum collection and audio tracks from SMB collections. Regarding the OLY collection, a total number of 26 objects was digitised in 2D and 3D techniques.

The production of the assets required both processing and optimising 3D models and generating some models starting from photographs and measurements in a direct modelling environment. This difference aimed to generate a 3D model also for objects that could not be digitised using one of the techniques presented above.



Figure 20. Some of the asset produced from OLY collections.

3.2.3 3D asset production and digitisation methods Pilot 3

Assets produced for Pilot 3 were digitised both from AQUILEIA archaeological area, or the House of Titus Macer, and from National Archaeological Museum where objects related to the area are stored.

N. 25 digital assets were produced for Pilot development, in a combination of bronze statues, ceramic oil lamps, marbles, amphoras and coins. Apart, of course, the most important building of the Domus itself was delivered as single asset that can be split into several rooms and digital objects such as the oven, the well and the mosaic room.

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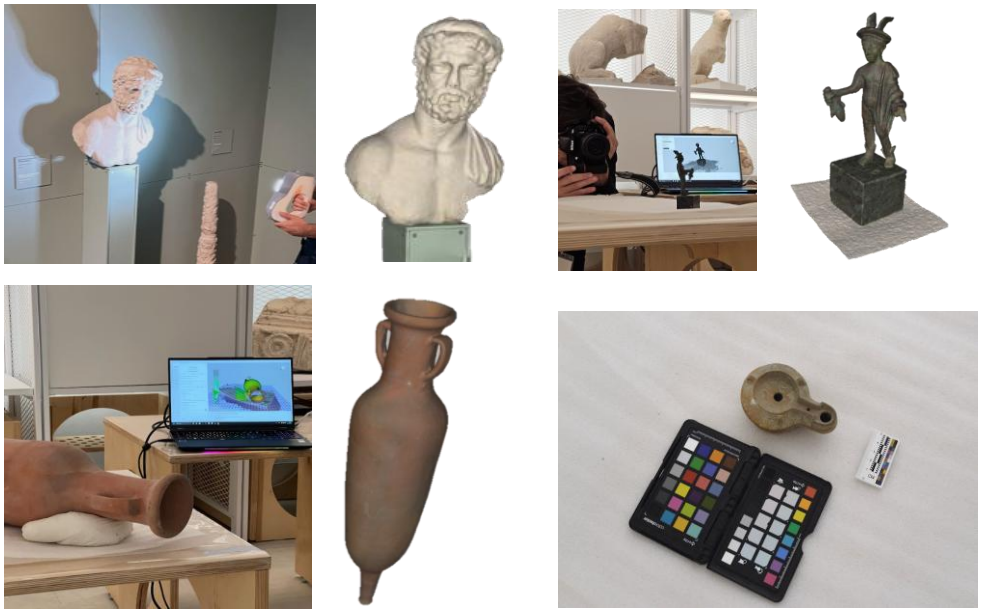


Figure 21. CH artefacts during the digitising process and after digitising from Aquileia



Figure 22. Some of the 3D assets produced from the archaeological area of Aquileia



Figure 23. Some of the 3D assets produced from the Museum of Aquileia

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3.3 Pilot 3 App Development

At the end of the digitisation process and after the delivery of all the assets, a virtual tour of the Titus Macer Domus is created. This immersive experience allows users to freely explore and navigate the archaeological site, interacting with the digital assets and their descriptions. The tour is narrative and interactive, accessible on-site via a QR code that links directly to the digital reconstruction, and remotely through a website. The main structure and interaction model of the virtual walkthrough includes the following characteristics:

• Users starting directly within the reconstructed area of the Domus or in the position according to the QR code.

• Basic movement controls via keyboard inputs and via touch interface (forward, backward, left, right, click).

• View manipulation through mouse movement and touch interface, enabling users to look around fluidly.

• Object interaction through mouse clicks and touch interaction, triggering pop-up windows containing detailed and narrative information such as provenance, typology, and function.

• Optimised 3D models, with refined mesh topology and texture resolution, ensuring high fidelity while maintaining real-time performance.

The 3D environment and secondary elements (terrain, vegetation, ambient assets) have been completed and delivered as new digital assets, even if not related to CH. The core interaction mechanics (walking, rotating, grabbing, and selecting) have been seamlessly integrated. Digitised museum objects have been placed within the virtual archaeological setting, providing contextualised scenarios that reflect their everyday use in the Roman period, informed by the prioritisation and contextualisation enablers.

This phase continued until the full interactive experience was developed, balancing educational content with engaging entertainment. The approach aligns with the concept of edutainment.

Some key features of the application in development are:

• ATON framework is used for app development. It allows for easy distinction between normal scene elements and scene elements with semantic content (used to distinguish environment models and interactive 3D models).

• Three.JS is the JavaScript library for creating 3D content in web/XR environments.

• Three-mesh-UI is the JavaScript library that facilitates the creation of spatial interfaces integrated into the 3D scene. It is used to create panels that appear when interacting with objects.

The virtual scene was created via an editor whose main functionalities are the import of assets as "ground" elements and other assets placed in specific positions. The representation of the scene can also be opened via JSON, in which the relation between the main building, the objects placed inside, and the semantic mask can be observed, allowing users to read the description and narrative contents.

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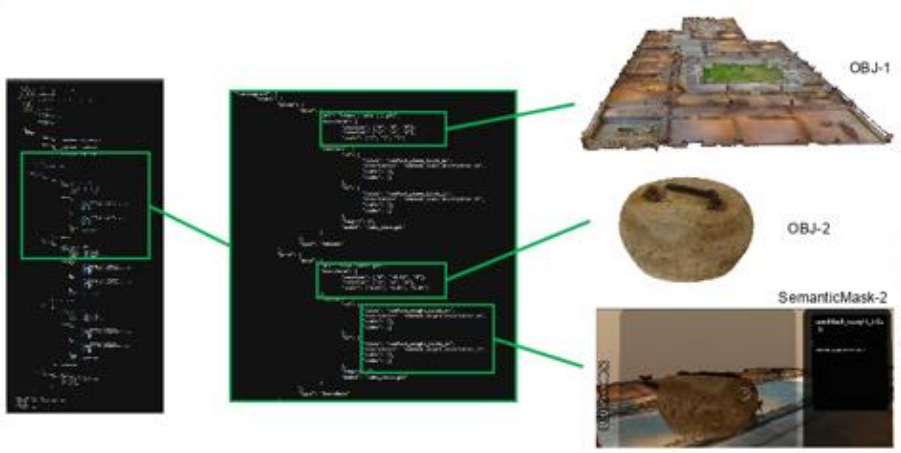


Figure 24. Representation via JSON of the virtual scene with objects placed and interactive panels.



Figure 25. Virtual environment prototype testing in VR environments (on left) and web view (on right).

Using the ATON framework, the web authoring application is dedicated to the creation, management, and publication of exploratory 3D scenes for the enhancement of cultural heritage. The application allows authors, museum curators, and researchers to enrich and structure complex three-dimensional content directly through the web browser (without installing any plugin or third-party software) and to make it accessible to a diverse audience across multiple devices. The key features of the tool are:

• Creation of Exploratory 3D Scenes: supports the import and visualisation of high-resolution three-dimensional polygonal models for an interactive and detailed inspection by the user.

• Semantic Visual Authoring: intuitive graphical interface to position and configure:

• Semantic masks: multimedia information points or annotations (texts, images, audio) linked directly to specific coordinates or elements of the 3D model to describe its details and properties;

• Hotspots for guides: interactive elements placed by the author within the 3D space to guide the visitor along educational paths and predefined stages within the scene;

• Advanced Analysis and Visualisation Tools:

• Spatial sectioning: clipping box tools to analyse the interior and sections of 3D models;

• 3D measurement: metric measurement tools to calculate distances and dimensions of objects in three-dimensional space;

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• Layers and Timing: organisation of layers into thematic levels or historical epochs to show the temporal evolution of the heritage asset or different reconstructive hypotheses;

• Universal and Cross-Device Delivery: the created scenes are accessible and optimised for desktop, mobile devices (smartphones/tablets), interactive museum kiosks, and virtual reality (VR) headsets thanks to the WebXR standard, allowing the user to virtually experience the 3D model in a 1:1 scale relationship;

• Management and Sharing: includes a role-based user dashboard (Authors/Viewers) to catalogue, search, duplicate, and delete scenes, with the ability to export and import the entire environment via compressed packages (.zip) and install the application as a Progressive Web App (PWA).

The tool has been configured to work in two different modalities, to be fully integrated into the REEVALUATE framework: Authoring tool and Presentation layer. Both integrations described below are designed around a common principle: cultural heritage assets, once digitised and made available through the Marketplace, are not tied to a single tool or a single use case. The same purchased 3D artefacts can be retrieved through the ATON Flare and reused across different authoring and presentation contexts, enabling a range of downstream applications built on top of the REEVALUATE platform. Once an artefact has been purchased through the Marketplace, it is not tied to a single application or a single moment of use. The purchase is linked to the user's unique identifier rather than to a specific tool, which means that any Flare-enabled application can retrieve it independently, without requiring the user to acquire it again for a different experience. This identifier-based approach is what allows the same underlying asset to circulate across the different components of the ecosystem. This works consistently because every integrated tool relies on the same authentication and Marketplace query mechanism to determine what a given user owns. As a result, the set of assets available to someone does not change depending on which tool they happen to be using at the time (the experience of "what I have access to" stays the same across contexts, rather than fragmenting into separate, tool-specific collections).

3.3.1 Authoring Tool

The tool is fully integrated into the project through a Flare, namely a plugin for the ATON environment responsible for orchestrating interactions with external services. In this case, the REEVALUATE repository acts itself as an external database. When the user accesses the Authoring Tool, the Flare automatically starts the process of retrieving the required information, without requiring any explicit interaction from the user:

1. First, the Flare queries the authentication service to obtain the unique identifier of the current user.
2. It then uses the endpoints exposed by the Marketplace to retrieve usage statistics and data related to the purchases made.
3. The user identifier is subsequently used to filter this information and determine the set of artefacts owned by the user.
4. The resulting list of available artefacts is made accessible within the Authoring Tool, allowing the user to select and use the purchased content to compose their scene.
5. Once the authoring phase has been completed, the user can generate a video, directly inside the explorable environment, representing the created experience, and submit it to the Context Validator Enabler, which performs the validation process.

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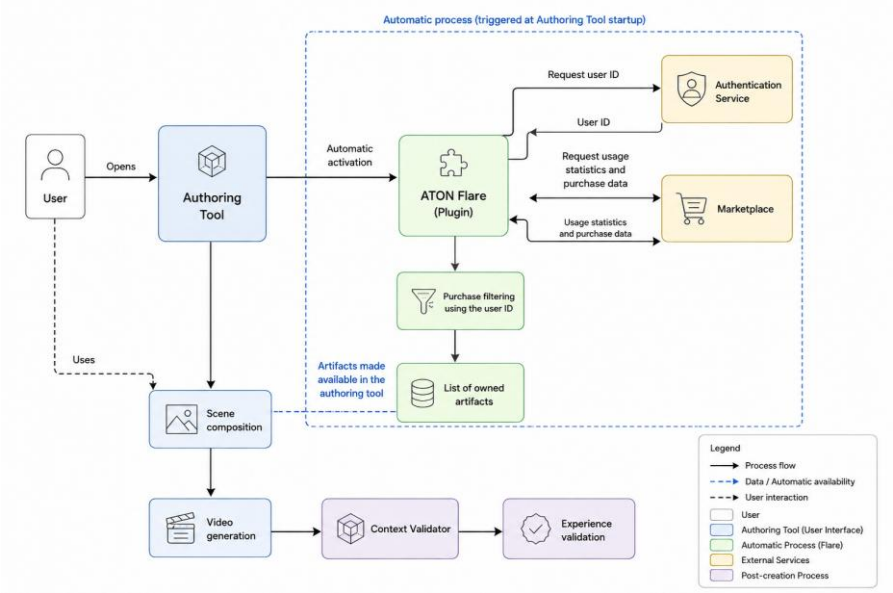


Figure 26. validation process

3.3.2 Presentation Layer

The Presentation Layer acts as an external touchpoint between virtual-experience producers and the REEVALUATE framework, being a clear example of the kind of result that interested companies or users may want when working with the framework.

1. The workflow begins again within the project platform, where the user accesses the Marketplace to select the objects required for the experience.

2. The process continues outside the platform through the Presentation Layer. Users download the needed file from the Marketplace, within this external component, the same ATON Flare previously adopted for the integration with the HUB is used to retrieve the corresponding models and make them available for the composition of the experience. The Flare operates as an internal integration component of the Presentation Layer and does not require direct interaction from the user.

3. After composing the experience, the user can again generate a video representing the resulting content.

4. The workflow then returns to the project platform, where the video is submitted to the Context Validator Enabler. The enabler processes the submitted video and performs the validation of the generated experience.

5. This architecture therefore separates the external authoring and presentation activities from the platform services, while using the video as the artefact through which the completed experience is reintroduced into the platform for validation.

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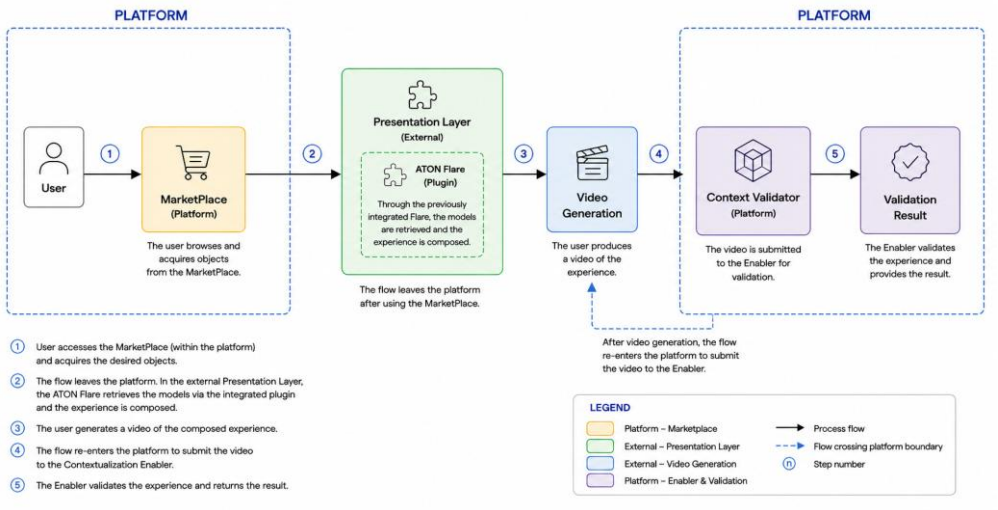


Figure 27. platform architecture



Figure 28. Screenshot of the Virtual Experience during the development stage. Blue layer: reconstructive hypothesis of the walls of the Domus, activable entering a room.

The Presentation Layer requires the creation of a sort of experience for users, as this is not a product that they can produce themselves. In line with this requirement and with the development of the Pilot, a small portion of the total number of digitised objects is being used. The key to the process lies in the use of 3D objects that play a particularly significant role and intertwine in the development of a self-contained and comprehensive narrative arc.

3.4 Virtual Museum

Developed under Task 4.2, a key demonstrator of the REEVALUATE framework is a virtual museum prototype created by CERTH. This immersive 3D environment showcases the practical and creative reuse of digitised Cultural Heritage (CH) artefacts, presenting a curated collection where each item is accompanied by detailed descriptions and directly linked to the REEVALUATE Marketplace for further engagement and reuse. To enhance the thematic cohesion and atmosphere, the prototype uses materials for contextual floor and wall textures, aligning the entire virtual space with the exhibition's

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narrative. This application stands as a tangible example of how digitised CH assets can be repurposed into engaging, interactive experiences that extend their cultural and educational value beyond traditional archives.

For Release 2 the prototype is a working standalone build. It was first shown end to end, over the whole visitor flow, in mid-June 2026. The gallery is built in Unity 2022.3 LTS with the Universal Render Pipeline and is entered from the start menu (Fig. 29). The visitor walks through it in first person. It shows the digitised MoMu garment ST2202, a ca. 1925 Art Deco evening dress (Fig. 30), on a display stand as a 3D object the visitor can inspect (Fig. 31). The gallery also holds several digitised assets from the Olympic Museum, so the environment is not limited to one collection. Clicking the artefact opens an information panel filled from its catalogue metadata, with 3D inspection and a link to the REEVALUATE Marketplace (Fig. 32). The wall and floor textures are materials that can be swapped while the application runs, so the gallery can be given a different look for another period without rebuilding it (Fig. 33 and Fig. 34). The build also includes a "Curator" assistant that the visitor can ask about the garment. It uses a large language model, but it is restricted to the metadata of the artefact on display, so the answers stay tied to the collection rather than to whatever the model happens to know (Fig. 35). From the gallery the visitor goes on to the try-on experience described below, where the garment is put on an animated avatar.

CERTH has designed a comprehensive development pipeline centred on motion and motion transfer, serving as the engine for the gamified experience. The pipeline transforms user-generated video, or a single image together with a short text prompt, into animated, customisable 3D avatars through three technical phases. The process begins with Foundation & Setup, integrating the SMPL-X statistical body model into the Unity game engine and creating a properly configured humanoid avatar essential for high-fidelity motion retargeting. The SMPL-X model provides a realistic, skinned, and parametric 3D human mesh with blend shapes for body shape, pose, and facial expression, offering a more efficient and robust approach than manipulating a static mesh (Fig. 37). The Core Animation Phase focuses on a robust system to acquire, retarget, and blend diverse motion data (dance, walk, etc.) onto the avatar skeleton. Finally, the Integration Phase incorporates dynamic digital garments from the fashion pilot, ensuring clothing reacts convincingly to both body shape and motion (Fig. 40). All three phases are complete for the first digitised artefact.

For Release 2 the engine supports two avatar paths. The visitor picks one in the avatar panel, and both use the same digitised garment (Fig. 36). The UMA path animates the avatar from the visitor's own movement, captured live on the local machine. The SMPL-X path animates it with generative AI running on a server, so the visitor does not have to move at all. Shared garment foundation. MoMu digitises the garments as 3D drapes in CLO3D. CERTH then prepares them for the engine in Blender. Each garment is adapted twice, once per path. For the UMA path it is added to the UMA 2 wardrobe system as a slot, overlay and recipe. For the SMPL-X path it is fitted to the SMPL-X body: the body shape is adjusted with shape keys and a shrink-wrap pass, and the garment is bound to the skeleton by transferring the skinning weights from the body. For ST2202 this covered 4 472 garment vertices (Fig. 37). In both cases the result is a skinned garment that follows the body when it moves. ST2202 has been through both routes; the five remaining MoMu garments will follow the same steps.

Path 1: live motion capture (UMA). This path copies the visitor's movement onto the dressed avatar as they move. A webcam feed is processed on the local machine: MediaPipe (BlazePose) finds the body landmarks in Python, and these are sent over a local UDP socket into Unity. An adapter written by CERTH maps the landmarks onto the UMA avatar's humanoid skeleton through Unity's HumanBodyBones and moves the bones each frame. Two things were needed to make it usable in a

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museum. First, a calibration step aligns the avatar to the visitor's standing pose, using quaternions. Second, a smoothing filter (spherical interpolation) removes the jitter in the landmarks. UMA rebuilds the avatar skeleton at runtime whenever the avatar or its outfit changes, so the adapter looks up its bone references again after every rebuild. The pipeline runs at about 18 FPS with around 100 ms latency. The camera feed stays on the machine: nothing is saved and nothing is sent anywhere, which matters for an installation open to the public. Preset motions such as catwalk poses are also available. This local-only processing is significant from a data protection perspective: no image or motion data leaves the visitor's machine, in line with the privacy-by-design approach set out in Section 1.10.

Path 2: generative AI motion (SMPL-X). This path animates the dressed avatar without the visitor moving. The visitor supplies an image and a short text prompt describing the movement. Wan 2.2, an identity-preserving generative diffusion model, produces a short video of the subject moving. The 3D pose and global motion are recovered from that video frame by frame with GVHMR / WHAM and applied to the SMPL-X avatar. The avatar is itself an SMPL-X body, so the motion is applied directly, and nothing is lost in retargeting between different skeletons. A real video of the visitor can also be used: it enters the chain at the motion recovery step and skips the generation. Both generation and motion recovery are heavy, so this path runs on a server and sends the SMPL-X motion back to Unity over an API. In the application the visitor first picks the avatar engine, UMA or SMPL-X (Fig. 38), then picks a garment from the digitised collection (Fig. 39), and then moves to the stage where the dressed avatar is animated (Fig. 40).

The creative reuse enabler API. The generative path runs as a service on a CERTH server and is reached from the application over an HTTP API, so that the heavy models are installed and maintained in one place rather than on every machine that runs the experience.

Two endpoints are provided, one for each way of driving the motion. The first takes a photograph together with a text prompt describing the movement. The second takes the same photograph together with a driving video, from which the movement is taken instead of being described. In both cases the application uploads the files directly to the endpoint, and the server replies immediately with a job identifier rather than holding the connection open, because a single generation takes several minutes. The application then polls the job until it reports success or failure, which keeps the interface responsive while the work is running and allows a request to be cancelled.

On the server, each job runs the same three steps in sequence. The generative model produces a short video of the person in the requested movement. The 3D human motion is then recovered from that video. Finally, the recovered motion is exported into the joint format used by the avatar in the engine. When the job is finished the application retrieves two results: the generated video, which is kept as a record of what was produced, and the motion itself, as a list of joint rotations and root positions together with the frame count and the frame rate. The application applies this motion to the dressed avatar. The garment and the avatar never leave the local machine, since only the motion is transferred.

Defining the enabler in this way means that it is not tied to this application. Any client able to send a photograph and a prompt, or a photograph and a driving video, can obtain motion in the same format, which is what allows the same enabler to serve further reuse applications beyond the Fashion App.

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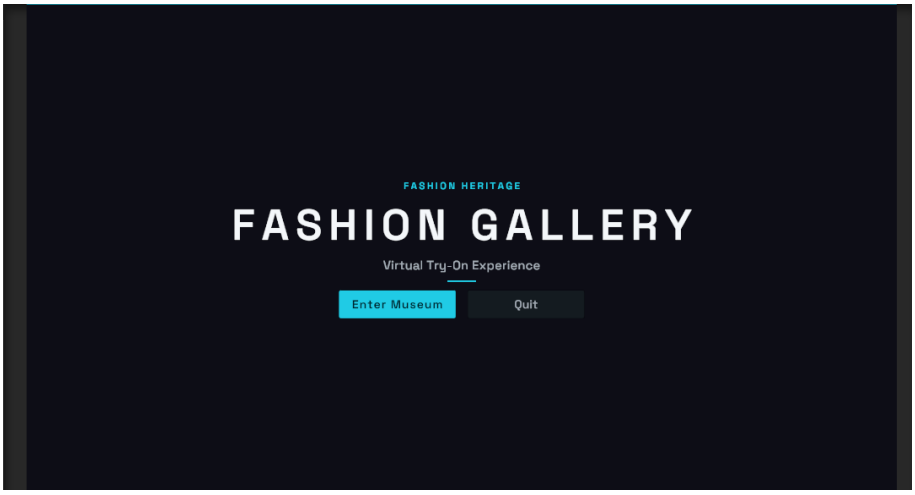


Figure 29. Fashion Gallery start menu.



Figure 30. The gallery with the digitised MoMu garment ST2202.



Figure 31. Evening dress ST2202 (ca. 1925) on display.

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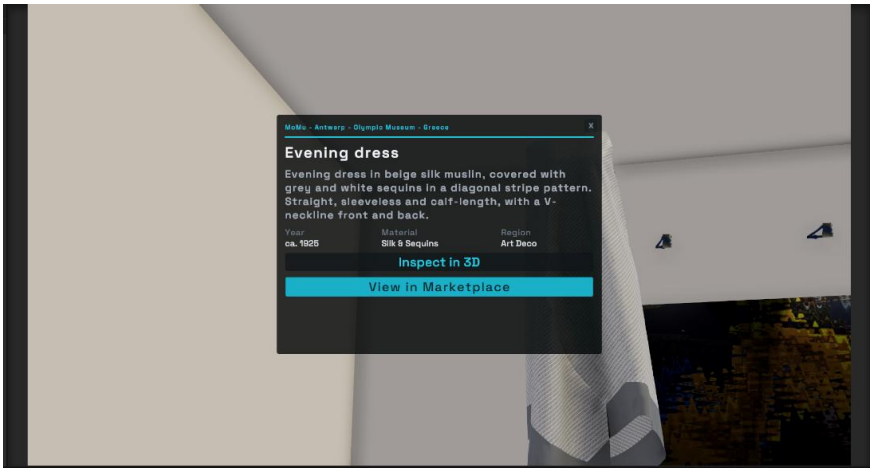


Figure 32. Artefact information panel with Marketplace link.

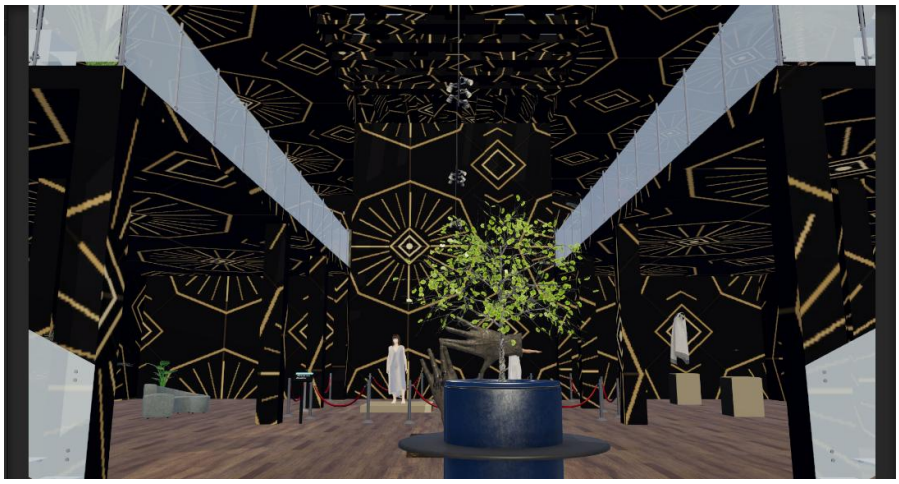


Figure 33. Art Deco wall and floor textures (gold variant).



Figure 34. Alternative texture variant applied at runtime.

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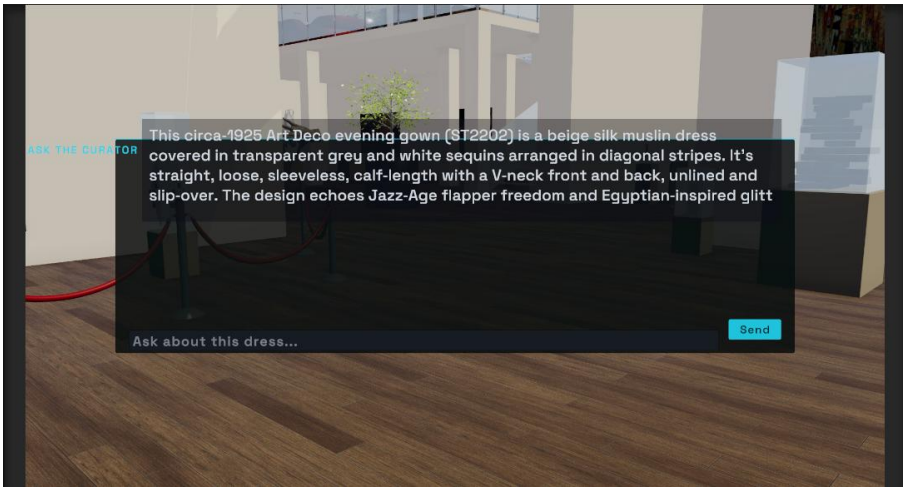


Figure 35. The Curator assistant answering a question about ST2202.

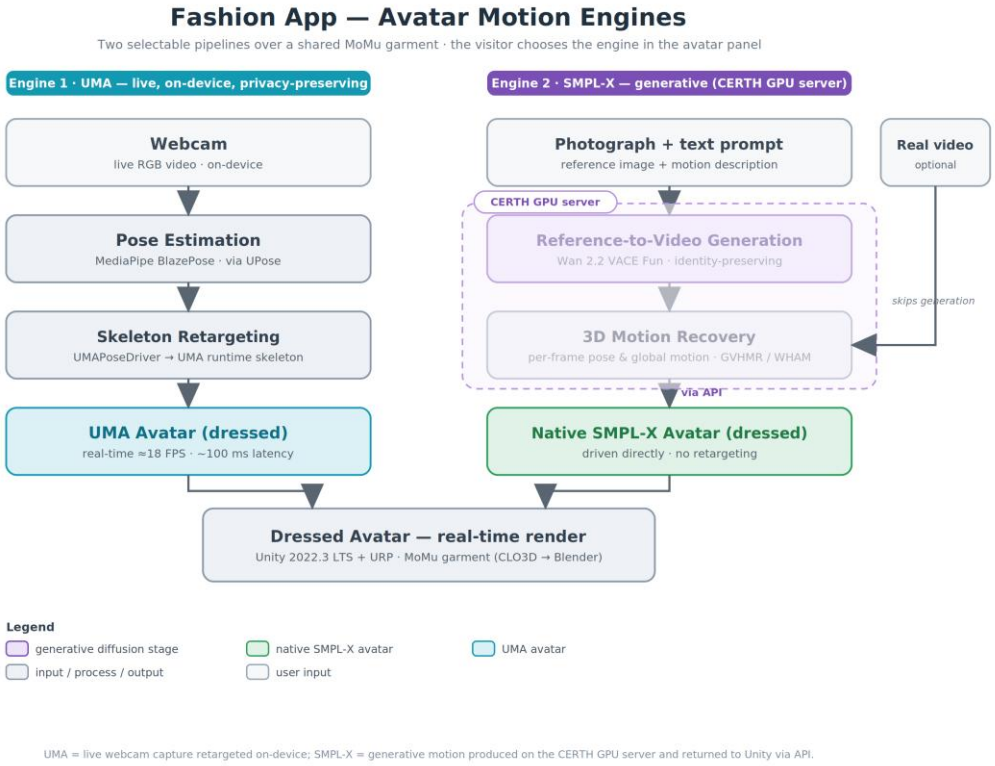


Figure 36. The two avatar motion engines of the Fashion App.

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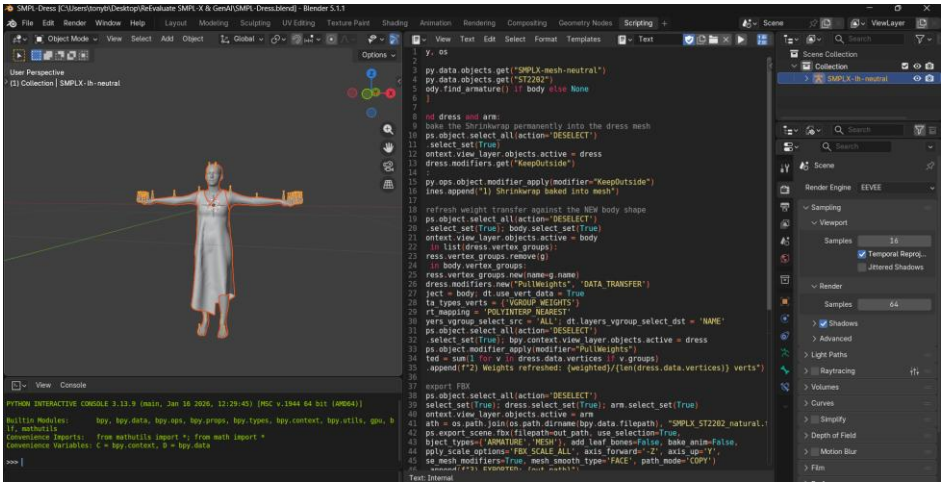


Figure 37. Garment preparation in Blender: ST2202 fitted to the SMPL-X body.

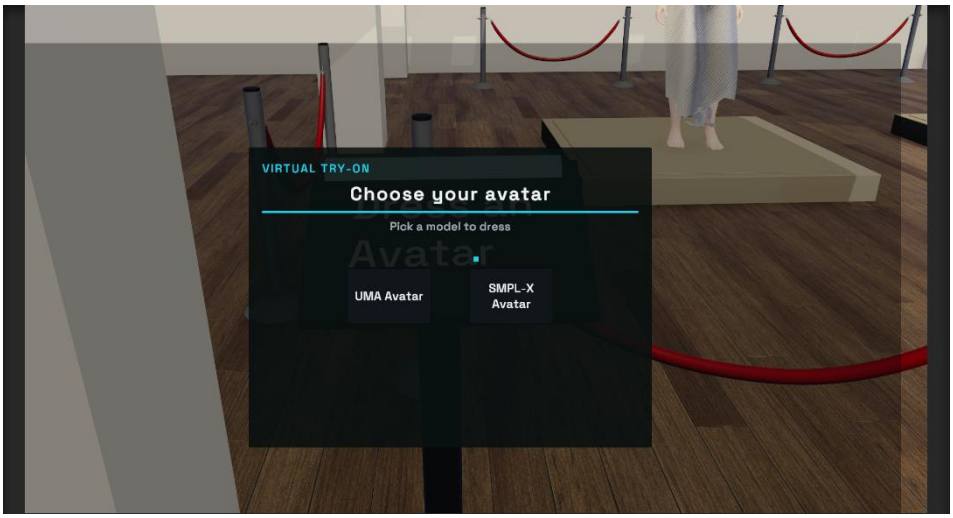


Figure 38. Avatar engine selection: UMA or SMPL-X.

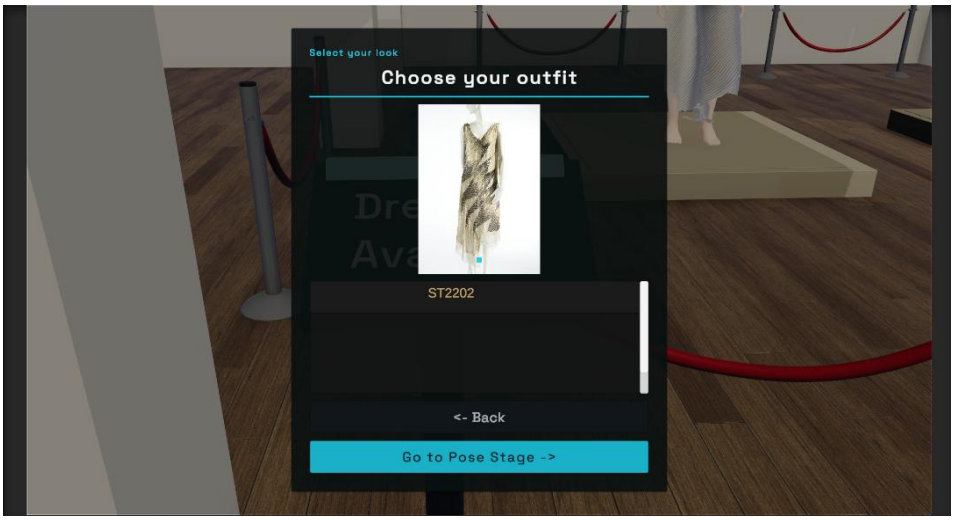


Figure 39. Garment selection from the digitised collection.

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Figure 40. The dressed avatar on the try-on stage.

The REEVALUATE platform utilizes a modular architecture and microservice deployment. CERTH used the Virtual Museum prototype to validate the required technical enablers, establishing the prototype as an independent creative reuse outcome. For the joint Fashion Time Machine pilot, CERTH develops the GenAI technologies for the digital game. This backend system utilizes generative diffusion models for: image and text to video; motion transfer from video; and motion correction to generate motion parameters. FFP builds the gamified Fashion App, described in the following section. The technologies are available to be used for the Fashion App through a standard API interface.

3.5 Fashion App

FFP's Fashion Application is a gamified experience which takes the Players (Users) on a 'behind the scenes', educational journey. Eight dresses were selected for final inclusion (*ST472, ST503, ST646, ST652, ST2202, ST80881, ST81114, TwinIt*) as shown in Figure below.

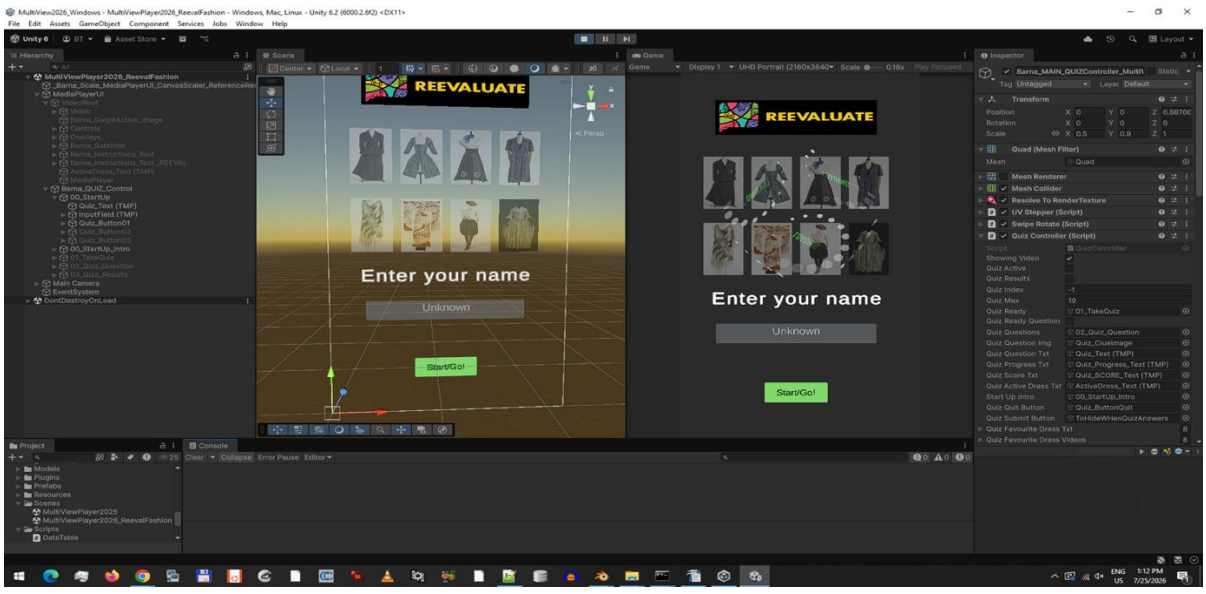


Figure 41. FFP's MultiView Fashion App in Unity.

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The Fashion App game focuses on the players exploring rendered production footage about how each of these dresses were digitized, reconstructed, 3D modeled, optimized, segmented and eventually photo-realistically animated to create an *interactive multi-view experience*. The content users can individually explore for each dress is divided into sections showcasing the

- Details of the original dress from MOMUs original exhibition, archives and webpage.
- Reconstructed game-ready 3D avatar wearing that dress,
- Segmentation and bones for rigging,
- High fidelity 3D models comprising of 1.5m polygons, and finally
- Photo-real renders from multiple angles.

This is demonstrated in the following figure for Dress ST2202



Figure 42 Reconstruction steps: original photos, game-ready avatar, segmentation and bones, 1.5m polygon model, multi-view photo-real render.

Each video finishes with a short virtual fashion show, featuring the moving person and floating dress on a catwalk and showing it in motion from multiple directions. This video is created by transferring the motion of a real-world fashion model recorded on an actual fashion show production.





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Figure 43. Photo-real virtual fashion show using MOMU's ST2202 artefact: (see text above).

The virtual fashion show can also be driven by animated humanoids created in Blender (featured in the following figure) or by any user motion captured by the CERTH enabler discussed above.

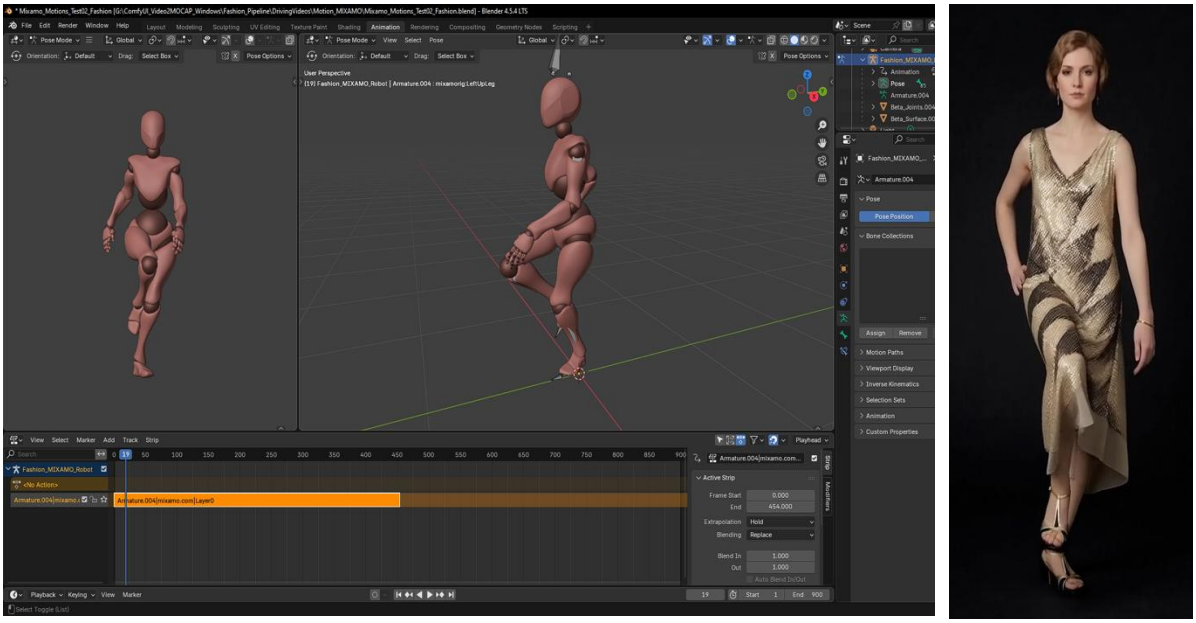


Figure 44. Driving a virtual fashion show with a humanoid robot animated in Blender.

Due to the multi-view playback players have simultaneous access to all 8 dresses, meaning they will miss important details if they do not watch the videos multiple times, or they will discover different elements each time they play again. As a result, excitement and learning value comes from their need to constantly explore the dresses and find as many details about them as possible while also memorizing additional details they may be asked about.

Once the exploration phase is finished, players answer a set of trivia questions to test their memory and see how well they remembered a variety of details. These trivia questions are designed to be 'curatorial' in nature and reveal educational elements about the time period, the dress itself, the fashion at the time etc.

After the scores are revealed, we showcase all dresses again in motion (on the virtual catwalk) and ask them for their favorite one for future reference. Finally, their scores and the correct answers are revealed with a brief explanation to provide further educational value.

To make the Fashion Application 'future proof' we control the entire content via an XML track description file that, therefore it is possible to produce content about new dresses, and/or modify the questions and explanations by simply copying new files into the player's relevant directory. The following figure shows an example of this descriptor XML and the accompanying SRT file that can be modified or easily updated in a text editor.

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```
<?xml version="1.0" encoding="UTF-8"?>
<config>
    <setup videoDivisions="4,2" numRowsColumns="1,8" angleRange="7" viewIdxFront="0" viewLimits="0,7" subTitlePosLandscape="0,500" subTitlePosPort
<!-- rZ="90" sX="0.85" sY="1.5" sZ="1.1" tX="0" tY="0" tZ="1.1" -->
  <control>
    <camera frame="0" viewMode = "1" orientation="1" swipe="0" />  <!-- Start in Portrait mode for instructions on black video background 50 seco
    <camera frame="12" viewMode = "1" orientation="1" swipe="1" viewLimits="0,7"/>  <!-- Start in Portrait mode for instructions on black video b
    <camera frame="1200" orientation="1" viewIdx="1" swipe="1" viewLimits="0,7" /> <!--  Start actual content after 50 seconds of instructions, t
    <camera frame="4400" viewMode = "0" orientation="1" swipe="-1" />   <!-- NOTE Use Swipe -1 to indicate that quiz starting Full Video length i
  </control>

    <!-- Quiz Questions -->
    <quiz clueimg="Quiz_Clue01.jpg" sX="0.51" sY="0.91" tX="1" tY="-151" question="What is wrong in this image? \nA) buttons missing \nB) hair co
    <quiz clueimg="Quiz_Clue02.png" sX="0.52" sY="0.92" tX="2" tY="-152" question="Question #2? \nA) Answer1 \nB) Answer2 \nC) Answer3 " answer="
    <quiz clueimg="Quiz_Clue03.png" sX="0.53" sY="0.93" tX="3" tY="-153" question="Question #2? \nA) AAAAA \nB) BBBBB \nC) CCCC " answer="C" />

    <!-- Quiz Solutions  -->
    <solution clueimg="Quiz_Solution01.jpg" sX="0.54" sY="0.94" tX="4" tY="-154" question="B) Hair color is Brown not amber"/>
    <solution clueimg="Quiz_Solution02.jpg" sX="0.55" sY="0.95" tX="5" tY="-155" question="A) Answer1 maybe explain"/>
    <solution clueimg="Quiz_Solution03.jpg" sX="0.55" sY="0.96" tX="6" tY="-156" question="C) CCCC maybe explain" />

  <!-- Custom Logo -->
  <display logoImg="Logo.png" label="(C) 2026" x="75" y="510.0"/>

</config>
```

Figure 45. Example XML file controlling the content of the Fashion Application.

The development of the FFP Fashion App is complete. For the remaining period we will fill it up with high-fidelity content including the 3D reconstructions, game-ready models, and virtual catwalk animations for the already selected complete set of 8 MOMU garments using the same production pipeline. The final desktop App is expected to be released and shared with MOMU mid-September.

3.6 Asset Creation, Pre-production, VFX and Surround Projection

In order to support the needs of advanced visualizations and renderings foreseen for Pilot1 during the current reporting period (starting 2026) FFP developed new content and delivered a) a large-scale scene reconstruction of the Olympic site, b) number of high resolution 3D object models, c) 3D historic characters, d) a real-timevisual effect system (VFX) and e) a multi-projector Unity application for interactive rendering on Olympic's projector units.

A total of 24 scanned low-resolution models from the collection of the Olympic Museum (shown in the Figure 46 below) provided a limited initial start-up set, which needed to be augmented to deliver ample visuals and source materials for the planned final output. The typical resolution of these models is around 40,000 – 100,000 polygons with one model (belt) reaching 275K due to its relative complexity. This complete dataset comprises of approx. 2.2m polygons total. In comparison, the models FFP created run in the order of 1.5million polygons each. Furthermore, there were also no model scanning steps planned (and therefore no 3D models were received) for the musical instruments from the Humboldt Museum so those had to be created as well.

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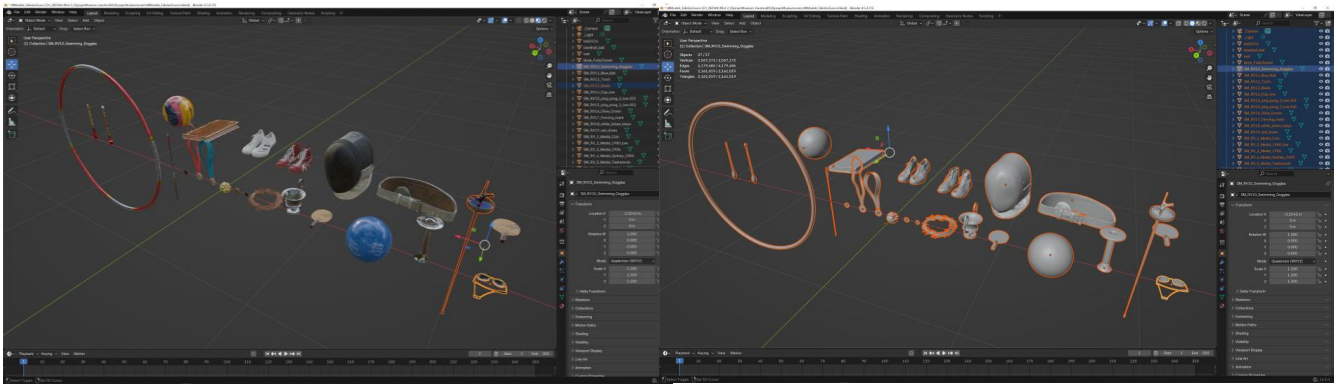


Figure 46: Total of 24 scanned models from the Olympic Museum collection (GLB files in Blender).

Additional 3D Modelling (people, animals, instruments):

To augment the available model set to work with, FFP first created an additional 20+ models of historic human characters and buildings at Olympia using reference photos collected from the Internet as well as special musical instruments (trumpets) captured with a simple camera by Humboldt staff. The following figures show some examples of this process. We start with reconstructing people from historic photographs. Figure 47 demonstrates the production pipeline and the required steps. The original image (upper left-hand corner) shows Sir Richard Chandler, the English antiquarian who brought the ancient sanctuary of Olympia to scholarly attention around 1766. The drawing depicts him in the company of a multitude of characters each of which are cropped and enlarged below. Using these enlarged pieces we modelled 8 high fidelity (1.5m polygon) characters in standard A-pose suitable for game-ready rigging and animation, thus laying the foundation to generate additional visuals that feed the rest of the final video creation pipeline.



Figure 47: Nine animation-ready characters people and animals reconstructed from a historic reference photo.

Another example showcasing the benefits of this process is shown in Figure 48. Specifically, people (characters) from an original archival black-and-white photograph showing the excavation of the site

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were used to pull reference images of discoverers, and local workers dressed in national attire and for work. Those references then served as the starting points to create an additional six high resolution human characters via FFP's standard production workflow digital enabler developed specifically for the REEVALUATE project. We also created an empty 'clean-plate' of the extended site (shown in the lower left-hand corner) with the help of AI-based production tools. This plate will be used to repopulate the scene with the reconstructed characters at a later stage, as required.

In addition to people and animals, FFP also reconstructed a set of musical instruments from a collection of multi-view reference photographs taken randomly at the museum. The results[25] are shown in Figure 49. The specific process is like SLAM-based photogrammetric reconstruction methods that first estimates camera intrinsic and extrinsic parameters together with 6DOF positions and re project a sparse point cloud. We used these point clouds as a starting point to train a custom 3DGS (3D Gaussian Splatting pipeline) and eventually re-imagine this object from that internal spatial AI representation as clean geometry. These new techniques (still under development) are the subject of a planned new publication we are planning to submit to SIGGRAPH next year.

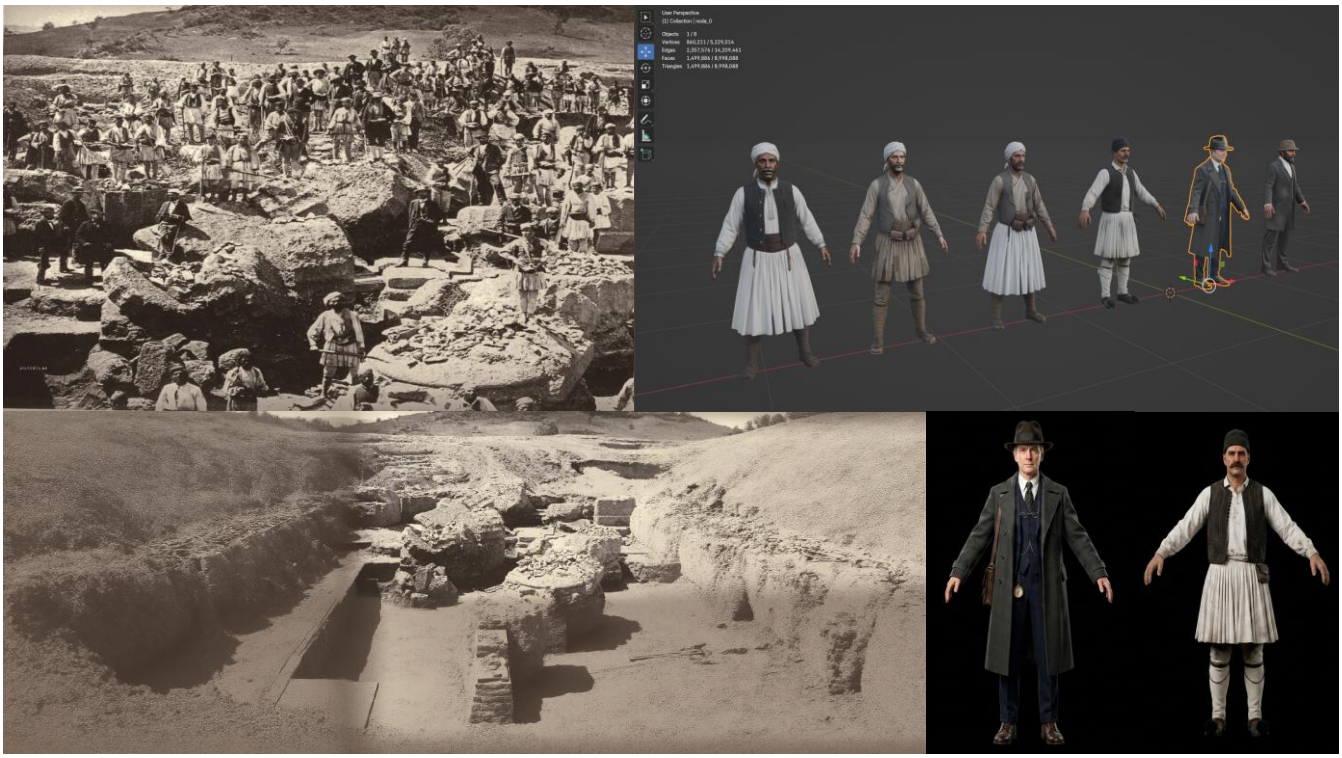


Figure 48: Six additional characters reconstructed in high resolution from another archival photo.

[25] Published in Takacs, B., Zs. Vincze, D. Popova and M. Mengel (2026), Towards Building AI-Based Solutions for Cultural Heritage Evaluation, Preservation and Restoration, in Proc. ICONS- International Conservation and Science Conference, (in press DOI will be available after publication)

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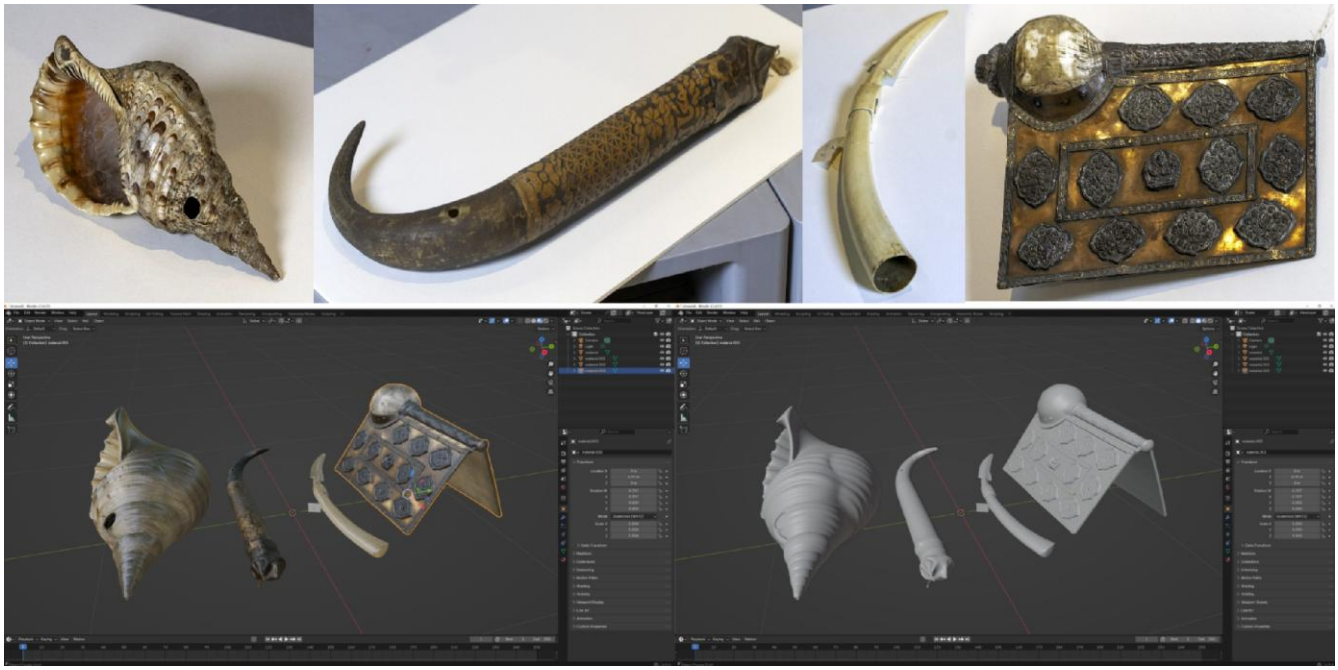


Figure 49: Musical instruments 3D reconstruction and modeling (see text).

Olympia Scene Reconstruction: The next step was to start building architectural and scene elements of the original Olympic site that could be used on large-scale projections. For this purpose, FFP first remodeled a set of building remains as it is found today and from reconstruction photos found in various museums around the world. Such example outputs are shown in Figure 50. These models will be used in the next visualization step to generate videos, and visual effect shots (or interactive futuristic transitions) planned for the final product.



Figure 50: 3D models created from reference photos found on the Internet or museum sites.

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To provide a visually grounded framework that can be projected around museum visitors (surround projection), and in which the above 3D models can be placed, FFP's next task was to construct and visualize a large scale 3*DGS* model of the area. To achieve this, we collected **660 satellite images** from *Google Earth* and reconstructed the surroundings of the amphitheatre by first running pairwise AI-based feature detection on each full resolution image and subsequently using *COLMAP* to compute camera poses and the initial point cloud model (PLY) for optimization. The resulting model contains 3.3 million splats shown in Figure 51. (lower right corner) after it was imported into *Unity*.



Figure 51: 3D Gaussian Splat reconstruction of the Olympia amphitheatre ruins from 660 Google Map images.

The benefits of using this 3DGS representation are twofold. First, it allows FFP to create additional visual elements and videos to complement the existing traditional film production pipeline with the help of particle-based visual effects (VFX), and second it also serves as the main visual environment for our Unity-based interactive multi-projector system. These are the subject of the following paragraphs.

Visual Effects and Rendered Videos from Unity Real-Time:

Shows a frame (phases) of a transition effect (Figure 52) that turns a 3DGS multi-million splats could into a particle system for visual effects (VFX). We pre-render these transitions from 72 camera angles to create a multi-view representation that can be viewed from any angle in real-time. To give a glimpse of the volume of computation involved, for a 10 sec video from any angle we render 240 HD or 4K images yielding 17,280 frames for a total of 12 minutes video storing that 10 second event. Therefore, real-time performance is essential for such and enabler. A demo video is available here: YouTube https://youtu.be/18IxrQayinc

Another use of particle-based visualization is demonstrated in Figure 53, where instead of 3DGS we turn the geometric models from the sections above into SDF (signed-distance-fields) which in turn control a variety of dynamic visualization possibilities tracing contours, sticking leaves just or to leave

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trails revealing the shape or silhouette of a historic figure. We combine these visual elements to optionally complement the main themes of the final video.

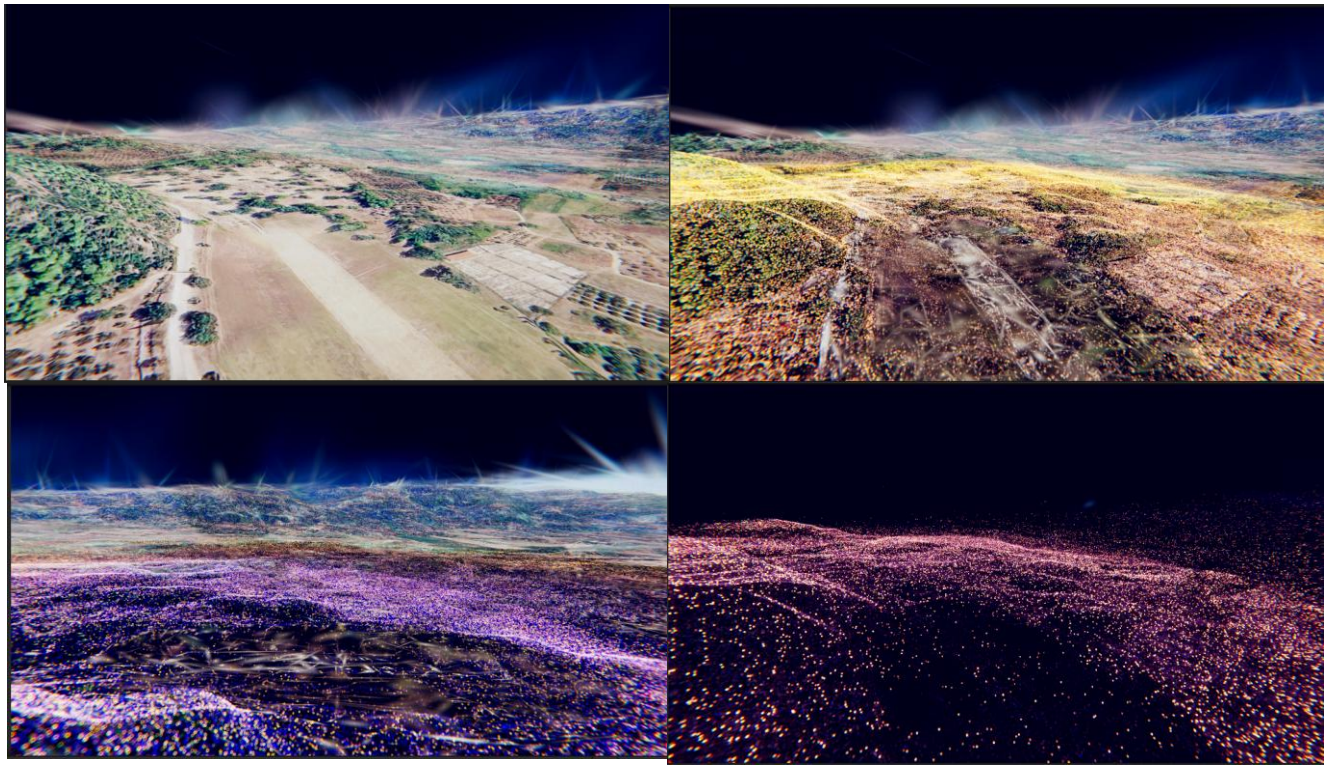


Figure 52: Particle-based multi-view effect applied to 3DGS model of Olympia transforming the scene.

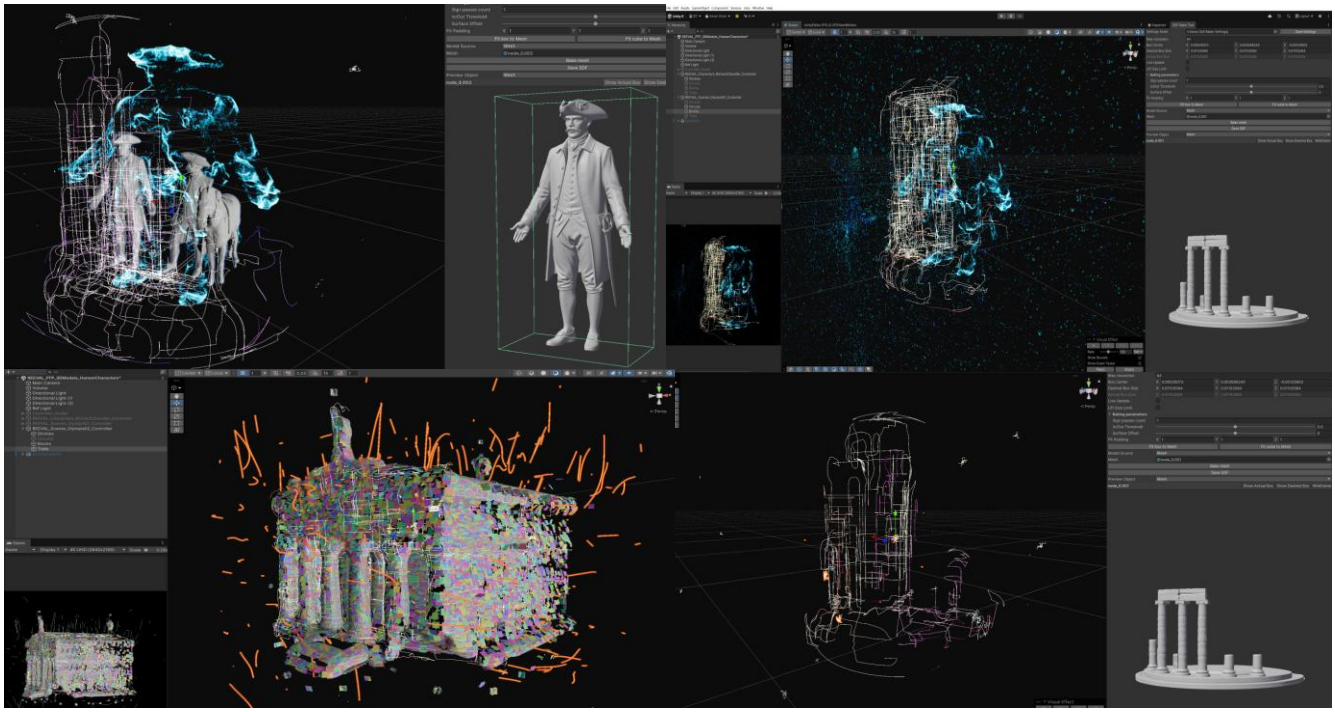


Figure 53: Particle-based SDF real-time effects applied to 3D models of architecture and characters.

The final piece of the puzzle is to use this real-time presentation and rendering system to drive directly the projectors in a museum, such as the 5-room setup at the Olympic Museum in Thessaloniki. To achieve that we can bring all the above-described visual elements as high fidelity polygonal models,

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3DGS scenes, particle effects and pre-rendered videos into a single scene with triggered timing and presentation timeline. To drive the projectors in a geometrically correct surround-projection setup, the virtual cameras in the scene must match the physical setup and pixel characteristics of the actual projectors used. We call this virtual camera rig the *XIM*[26] interface as shown in Figure 54, where a virtual camera rig generates six views (left, front, right, back, bottom, top) for a full cubic projection.

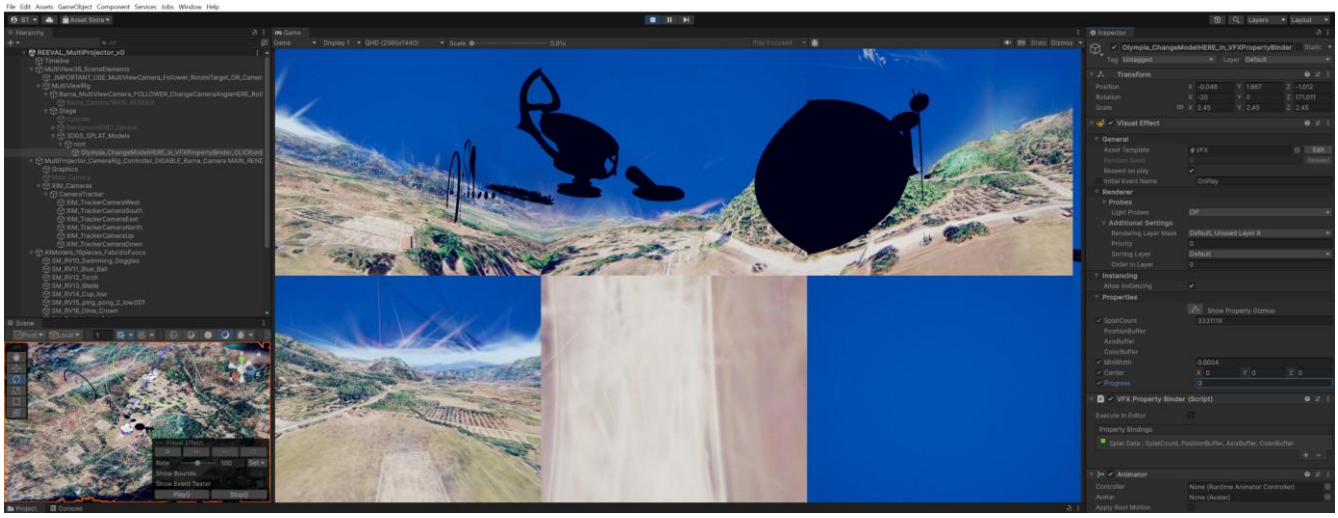


Figure 54: Multi-projector interactive visualization system implemented in Unity.

Parts of the asset-creation and reconstruction work described in this section have been submitted for publication as: Takacs, B., Zs. Vincze, D. Popova and M. Mengel (2026), "Towards Building AI-Based Solutions for Cultural Heritage Evaluation, Preservation and Restoration", Proc. ICONS - International Conservation and Science Conference (in press; DOI to follow upon publication).

3.7 Advertising Trailer 'Olympia' – in production first look

The advertising trailer “Olympia” or trailer is produced by FFP through an AI-assisted pipeline that treats the digitised artefacts of the Olympic Museum of Thessaloniki not as decorative material but as the factual ground truth of every scene. The production is organised around the five thematic units elaborated by the Olympic Museum, with the digitised artefacts (Section 2.2.3, Table 2) and the SMB/SPK sound recordings (Table 3) as the source material.

3.7.1 Production under the Empirica framework

Alongside the REEVALUATE enablers, FFP committed additional resources of its own to the pilot: the production runs under Empirica, an open-source framework (MIT licence) for measured AI work developed by EmpiricaAI[27], in which FFP is an early investor (see the disclosure later in this section). Empirica wraps the work of an AI system in explicit, auditable units called epistemic transactions. Before a unit of work begins, the AI states what it knows, what it does not know, and what it intends to do; while working, it must log what it finds, what it assumes, and what it gets wrong; when the unit

[26] XIM is a hardware adapter used in video gaming that translates mouse and keyboard inputs into standard controller signals for consoles like PlayStation and Xbox.

[27] www.getempirica.com, github.com/EmpiricaAI/empirica

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ends, its self-assessment is compared against grounded evidence - files actually read, sources actually retrieved, outputs actually produced. The difference between what the system claimed about its own state and what the evidence supports is measured and recorded as its calibration. An AI that overstates what it knows is not corrected silently; the gap itself becomes part of the record.

Empirica's starting point is epistemology, the branch of philosophy that asks how knowledge is acquired and how a claim to know can be justified. Applied to AI, the question becomes concrete: before a system acts, what does it actually know, and how would anyone tell? Empirica makes this measurable through thirteen epistemic vectors, each a value between 0.0 and 1.0 that the AI assesses about its own state: know (understanding of the domain), do (ability to execute), context, clarity, coherence, signal, density, state, change, completion, impact, engagement, and uncertainty (what it knows it does not know). The vectors are declared beliefs, not scores; their value lies in being checked against evidence.

Each unit of work runs as an epistemic transaction with three measured moments. PREFLIGHT opens the window: the AI declares its vectors before touching the task. CHECK certifies the transition from investigation to action: the AI names the specific claims its next actions rest on and how each one was grounded (a file read, a command run, a source retrieved, or an open assumption); when the work rests on unverified priors, this certification is required before the system may proceed. POSTFLIGHT closes the window: the final self-assessment is compared against the grounded evidence of what actually happened, and the difference is recorded as the AI's calibration.

While a transaction is open, everything the AI learns is logged as typed artifacts: findings (what turned out to be true), unknowns (what remains open), assumptions (what is taken for granted without verification), decisions (what was chosen, and why), dead ends (what was tried and failed), and mistakes (what the AI itself got wrong). These artifacts persist beyond the session: when the next transaction opens, the relevant prior artifacts are retrieved into its starting context, so each unit of work begins from what the practice has already learned rather than from zero, and the calibration history accumulated across transactions determines how far the system's self-assessment can be trusted.

For REEVALUATE, this discipline is applied to a question at the heart of the project: can generative AI be trusted to reuse digitised cultural heritage without distorting it? The answer is structural rather than aspirational. Every factual claim a scene makes - what an artefact is, what a historical practice was, who a person was - must be traceable to a named source before it may be acted on; claims that cannot be traced are either removed or explicitly declared as dramatisation. The material FFP received from the Olympic Museum of Thessaloniki - the digitised artefacts, the museum's own artefact descriptions, and the five thematic units (see Annex A) - is treated as the source layer of the production, and it is not only used but re-verified, as described below.

The production is carried out by a team of specialised AI practitioners: one for storyboarding, one for image generation, one for video generation, and one for editing. The term is deliberate. An AI agent, in the current industry usage, is a transient executor - it is instantiated for a task, performs it, and disappears, retaining nothing. An Empirica practitioner is a persistent seat of work, closer to the professional sense of a “practice”: it accumulates findings, mistakes, calibration history and domain knowledge across tasks, and the next unit of work starts from what the practice has already learned rather than from zero. The image-generation practitioner that renders shots for the fifth scene of Olympia knows what failed in the first.

Because FFP operates the practitioners on a shared Empirica server, they also exchange knowledge with one another in a measured way: findings established by one practitioner are retrievable by the

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others, with their provenance attached. The kotinos provides the concrete example. When the digitised wreath (SM_RV_16, see Figure 55) was first brought into production, the image-generation practitioner established, by measurement against the museum's source renders, the visual invariants that define the object - dried golden-brown olive rather than fresh green, the open ring where the two stem ends overlap, the wire ties and the cloth binding at the join. Those invariants were logged once, as findings of that practice, and from then on every other practitioner that touched the wreath inherited them: the storyboard practitioner wrote them into the shot specifications of subsequent scenes, the video-generation practitioner enforced them when animating, and the certificate of each finished scene reprints them as the conditions the artefact must satisfy in every frame. Knowledge about the artefact was established once, under measurement, and could no longer silently degrade on its way through the pipeline.

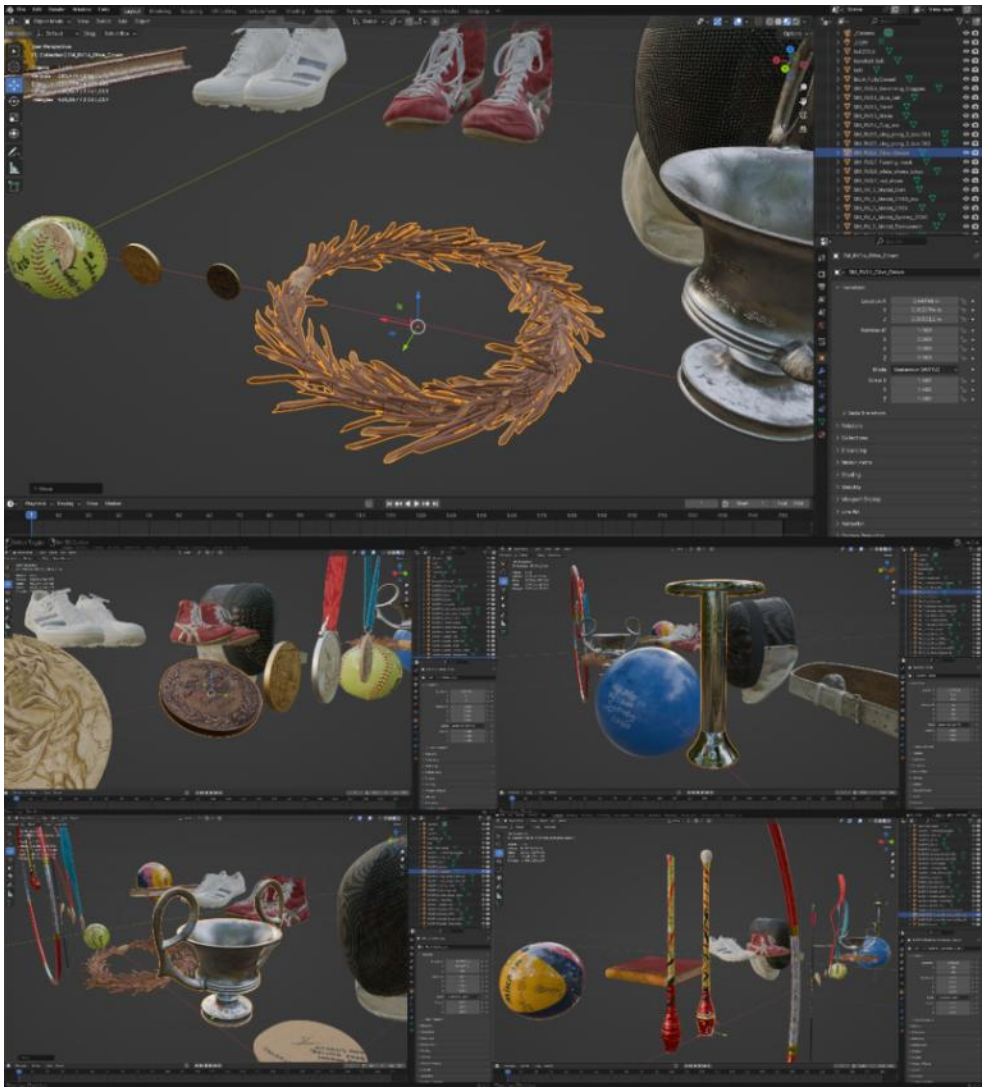


Figure 55: 3D model close-ups used in the "Olympia" advertising trailer (olive wreath, medal, torch, cup & club).

This approach is FFP's practical implementation of trustworthy AI in the sense the European frameworks give the term: transparency (what the AI did and why is recorded, not reconstructed), traceability (every claim in the output can be followed back to its source), honesty about limitations (what is invented is declared as invented; mistakes are kept on record rather than removed), and human oversight (actions with consequences outside the AI's own workspace pass through a human decision

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gate). The certificates of provenance described below are the public face of this discipline: they exist so that a curator, a reviewer or a viewer can audit a scene without trusting anyone's word for it.

The Empirica ecosystem is layered, and each layer's maturity is openly declared. The core framework (empirica) is open source under the MIT licence (github.com/EmpiricaAI/empirica) and can be self-hosted; a second harness (ecodex, Apache-2.0 licence) extends the same discipline to OpenAI-compatible models, making the approach model-agnostic at the command-line and data layer, with integrations currently maintained for two vendor ecosystems; the coordination layer (Cortex, in early access) is proprietary and adds the measured knowledge exchange between practitioners and the routing of decisions to the operator; and a browser extension (in beta) gives the operator the control surface. For a European deployment this draws the sovereignty line clearly: the measurement discipline, the data it produces and the production method itself run on open-source components under the operator's full control, and the hosted coordination layer is a declared, optional dependency rather than a hidden one.

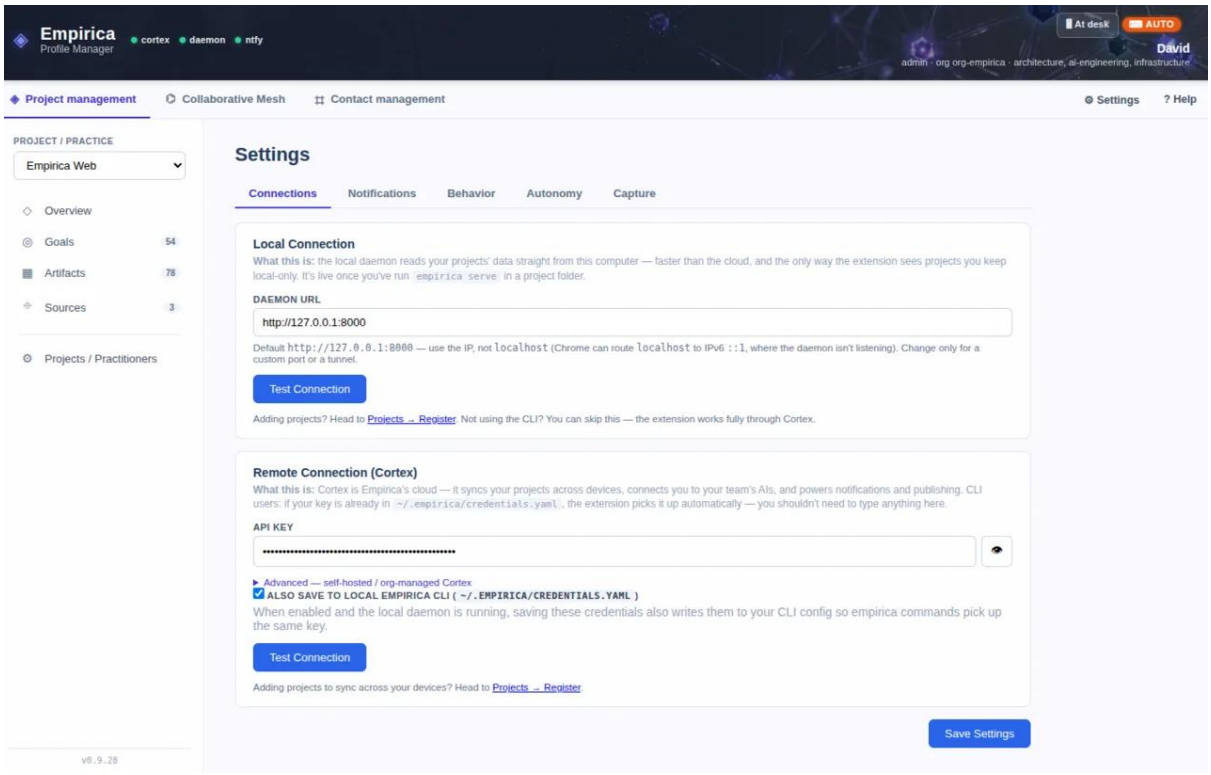


Figure 56: Connection settings of the Empirica browser extension:

The reason FFP considers this discipline necessary is trust. A general-purpose AI assistant is trained to produce plausible, agreeable continuations of whatever it is given; left unchecked, it tends toward sycophancy and toward fluent answers that are not anchored in verified fact. Empirica's response is structural: the AI must declare what it knows before the work begins, must ground the claims its actions rest on, and actions that change state outside the AI's own workspace are blocked until that declaration supports them, enforced wherever the execution environment provides a blocking hook. The system does not make the AI more capable; it makes the AI's ignorance visible and consequential. An AI operating under Empirica can still be wrong, but it cannot act as though it knew when it did not, and the record shows exactly what was known, assumed and unverified at every step.

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The human stays in the loop by design. Readiness is assessed against thresholds on the declared vectors; in the default configuration a task counts as ready when declared knowledge reaches at least 0.70 and declared uncertainty stays at or below 0.35, and both thresholds are configurable and tighten automatically as calibration history accumulates. Independently of the thresholds, any action classified as state-changing is routed as a proposal to the operator, who accepts, declines or changes it; this decision gate can be tuned from fully manual review to automatic routing of low-risk routine steps. FFP's operators work through the browser extension, which surfaces each practice's goals, its epistemic record of findings, decisions, unknowns and dead ends, its registered sources, and the collaborative mesh between practitioners, including the pending accept / decline / change decisions.

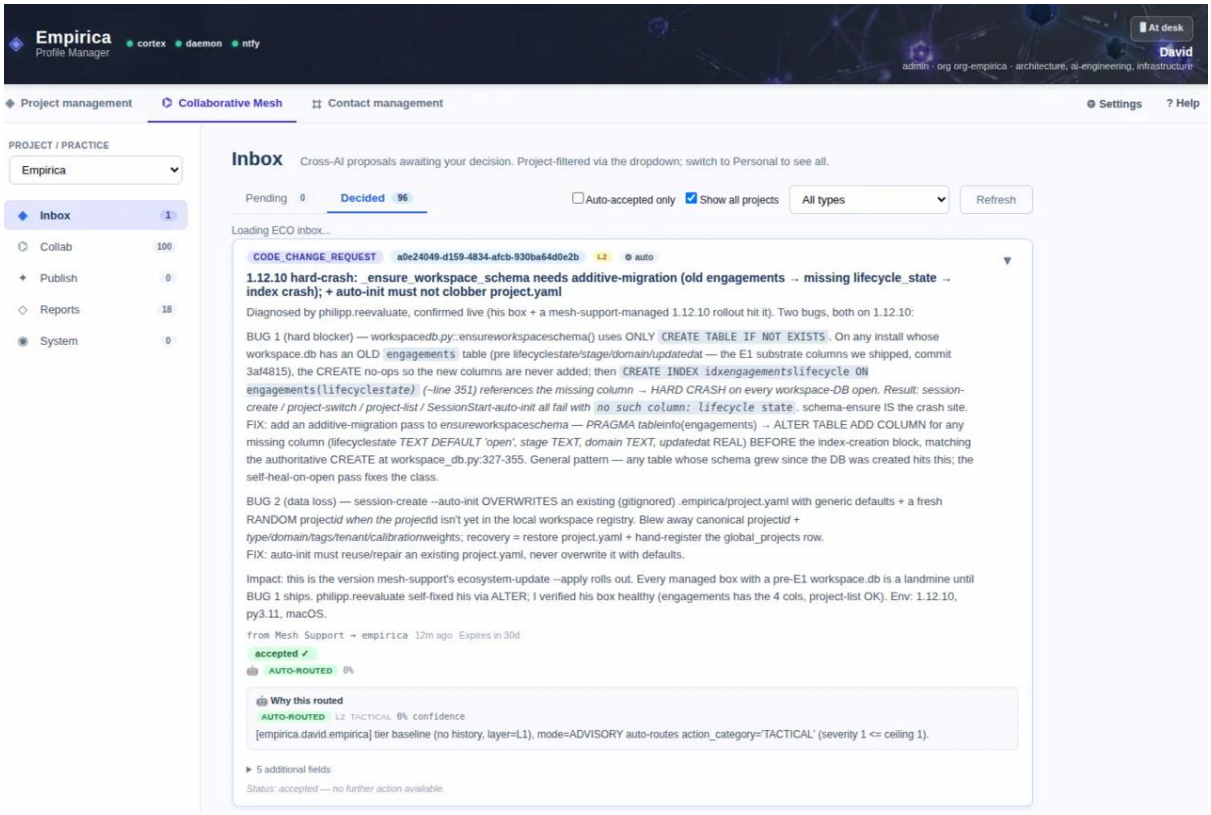


Figure 57: The decision inbox of the Empirica browser extension: each state-changing proposal is routed for an accept, decline or change decision, with the routing rationale displayed alongside.

Beyond the Olympia production, FFP applies the same discipline across its wider production practice. Empirica is used wherever AI contributes to FFP's work: research and verification of source material, drafting and checking of documentation, and the planning and quality control of AI-assisted media production. The value for a production company is general rather than specific to one film: any AI-assisted step can be run as a measured unit of work whose claims are traceable to named sources and whose outputs carry a verifiable record. For cultural heritage work in particular, this makes the use of AI auditable towards the content-holding institution, and the approach demonstrated in this pilot (sourced ground truth, artefact reference images, certificates of provenance) can be applied unchanged to other collections and other productions.

For transparency it should be disclosed that FFP's relationship to Empirica is not only that of a user: FFP is an early investor in EmpiricaAI, the company developing the framework, and the production described here uses, in addition to the open-source core, capabilities of EmpiricaAI's proprietary server - notably the shared knowledge exchange between practitioners described above. The open-source core is publicly available at getempirica.com and is fully capable of everything demonstrated

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in this section - the transactions, the sourced shotlists, the artefact invariants, the certificates of provenance and the measured calibration - when the production is run as a single practice; what the proprietary server adds is the division of the work across multiple specialised practitioners and the measured knowledge exchange between them. The framework's measurement method, together with a published dataset of 1,190,265 evidence observations from 792 AI work sessions, is documented in: Van Assche, D. S. L. and P. Schwinger (2026), "Empirica: Epistemic Self-Assessment for AI Systems - Dataset & Companion Guide", Zenodo, DOI 10.5281/zenodo.19252275.[28]

3.7.2 The Three production rules

For a film built on museum artefacts, the discipline translates into three production rules. First, the sourced shotlist. Every scene is developed from a shotlist in which each visual claim is anchored to the museum's artefact documentation or to the historical record, with the source named. Where the record does not specify a detail, the shotlist marks it explicitly, and the scene either keeps it out of frame or declares it as dramatization. An excerpt from the sourced shotlist of the scene "The Cutting of the Wreath", followed by the actual generation prompts derived from its first shot, illustrates the chain from source to claim to prompt:

EXHIBIT A shot-list excerpt:

SHOT 1 - THE TREE (~4s, wide, slow push-in). The Elaia Kallistephanos - a single ancient wild olive, gnarled and silver-leaved, standing alone beside the flank of the Temple of Zeus. Low sun rakes through the leaves. The grove is still. Claim: the wreath came from one specific sacred tree growing beside the Temple of Zeus at Olympia. - Sourced.



Figure 58: Generated frame from 'The Cutting of the Wreath', Shot 1: the sacred olive tree beside the Temple of Zeus.

SHOT 2 - THE GOLDEN SHEARS (~4s, tight, locked off). A boy's hands close a pair of golden shears on a slender olive branch. The cut is clean and unhurried. Sunlight catches the gold. Claim: branches were cut by a pais amphithales - a boy with both parents living - using golden shears. - Sourced. Not shown: his face, his clothing. The record does not describe them.

[28] Zenodo, DOI 10.5281/zenodo.19252275

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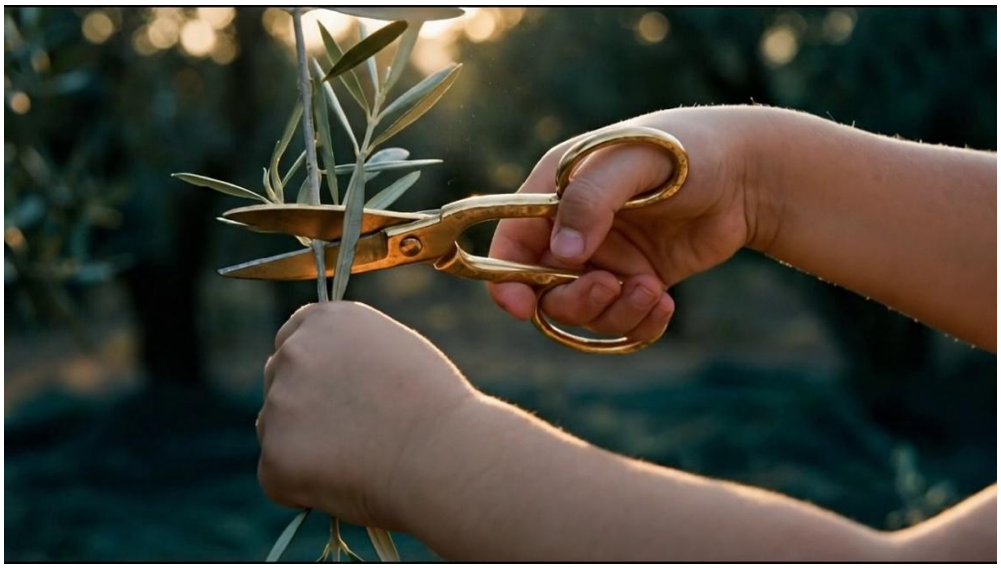


Figure 59: Generated frame, Shot 2: the golden shears close on the olive branch.

SHOT 3 - THE GOLD-AND-IVORY TABLE (~4s, slow lateral drift). Inside the Temple of Hera. Cut branches are laid on a table of gold and ivory. Shafts of light fall between columns. Nothing else moves. Claim: the branches were carried to the Temple of Hera and placed on a gold-and-ivory table. - Sourced.

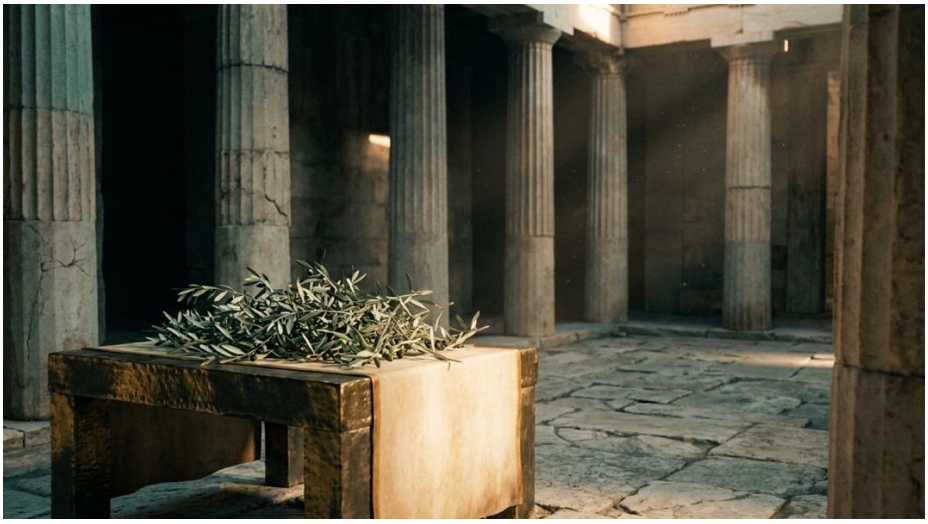


Figure 60: Generated frame, Shot 3: the cut branches on the gold-and-ivory table in the Temple of Hera.

SHOT 4 - THE CROWN (~4s, locked off, the wreath rises). The finished kotinos is lifted from the stone by the hands of a Hellanodikes in a deep-red chiton. Uses the real digitised artefact - SM_RV_16, the Athens 2004 kotinos. The wreath just lifted is not ancient: it was cut for Ilias Iliadis, aged 17, at Athens 2004 - the first Olympic medal in the history of Greek judo. The ancient rite and the modern object are the same gesture, 2,700 years apart.

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Figure 61: Generated frame, Shot 4: the finished kotinos, generated from the digitised artefact SM_RV_16.

Honesty notes (what we are not asserting): Pausanias wrote in the 2nd century AD about a rite he may not have witnessed - the scene presents what was recorded, not what was filmed by a witness. The boy's appearance, dress and age are unrecorded - kept out of frame. The table's form beyond "gold and ivory" is unrecorded - kept abstract. Whether the 2004 wreath used Olympia wild olive specifically is unverified - logged as an assumption.

EXHIBIT B - generation prompts:

The generation prompts derived from Shot 1 illustrate the final link of the chain. Image prompt: "A single ancient wild olive tree standing alone beside the weathered stone flank of a Greek temple at Olympia. The trunk is gnarled, split and hollowed with great age; the leaves are narrow and silver-green. Low sun rakes through the canopy from the left, throwing long shadows across dry ground and fallen blocks of stone. The sacred grove is empty and still. No people." The prompt is followed by the production's locked style block (grade, lens, grain), applied verbatim to every shot for continuity. Motion prompt: "A single continuous cinematic shot. One very slow push-in toward the ancient wild olive tree. The camera moves gently and continuously, never far. The tree itself is still except for the faintest stirring of the narrow leaves, and fine dust drifting in the low sun. Nothing else moves. No people enter. No text, no cuts, no camera shake."

Note what the prompts do not contain: no invented ornament, no faces, no inscriptions. They carry only what the shotlist's sourced claims license, plus the locked style block that keeps separately generated shots cutting together as one scene. The complete shotlist is reproduced in Annex B.

Second, artefact-as-reference generation. Shots that carry a digitised artefact are generated with the artefact's source render attached as a reference image, never described from memory, and each artefact carries a set of visual invariants established by measurement against the museum's renders - for the kotinos (SM_RV_16): dried golden-brown olive, never fresh green; narrow lanceolate leaves densely packed; the open ring where the two stem ends overlap; the wire ties and the pale cloth binding at the join. The pipeline resolves every artefact a shot declares against the asset registry, attaches its reference, injects its invariants into both the image and the motion prompts, and refuses to generate if a declared artefact cannot be loaded.

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Figure 62: The museum's source render of the digitised kotinos (SM_RV_16); this render travels with every shot that carries the artefact as its reference image.

The value of this rule was demonstrated under controlled conditions during production of the scene "The Crowning". In the first generation run, only the first of the four shots carried the artefact's reference image; the other shots relied on the model's memory of the wreath. The result: the shot with the reference reproduced the artefact faithfully - the cloth binding and the open ring, the two most difficult invariants, both visible - while the shots without it each invented a different wreath of fresh green olive, an object the museum does not hold. Same scene, same model, same day; the only variable was whether the digitised artefact travelled with the prompt. The fix was not an image correction but a pipeline change: reference threading became mandatory for every declared artefact, and the re-run of the same shots produced the dried golden-brown wreath of the digitisation in every frame.

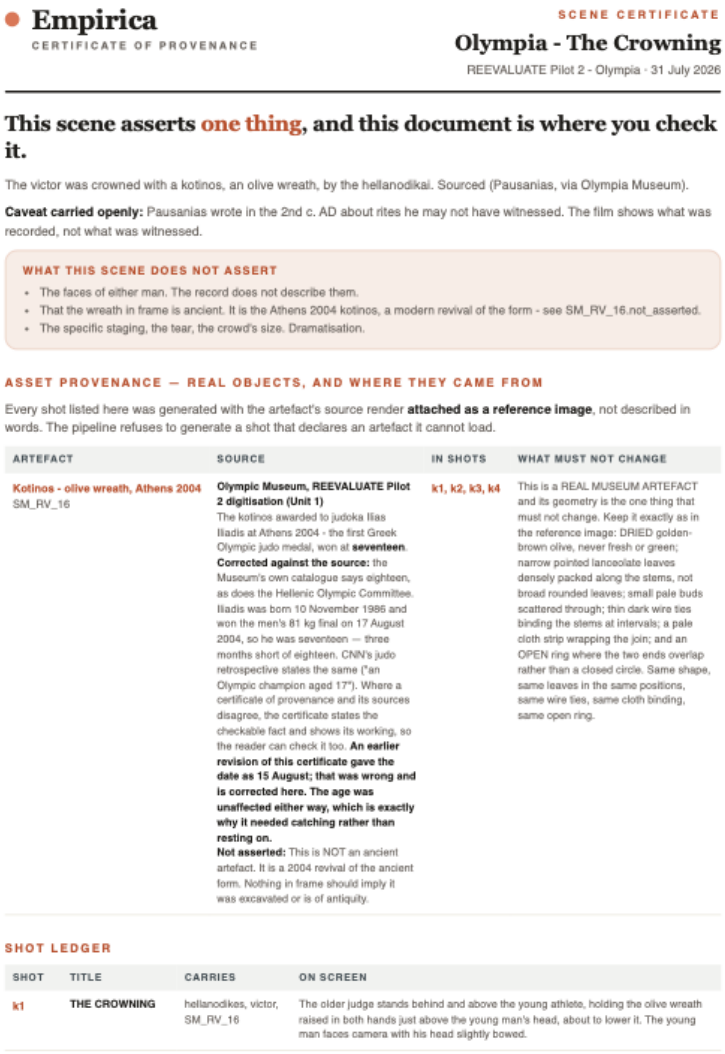


Figure 63: The controlled demonstration. Left: generated without the reference, the model invents a fresh green wreath. Centre: the same shot re-run with reference threading reproduces the digitised artefact. Right: the control shot, which carried the reference in both runs and stayed faithful.

The failure has a precise mechanism, and a second scene provides the control that isolates it. In "The Cutting of the Wreath", the living olive tree - correctly silver-green - rendered correctly in every run: the model has no difficulty with colour. What the model does, absent the reference, is revert an artefact to the most-represented instance of its category: living olive foliage is vastly more common in its training data than a dried votive wreath, so the dried artefact reverted to the state of its own raw material. The same reversion-to-type explains failures that would otherwise read as unrelated: the historically correct inscription TOKIO on a 2020 artefact rendered as the conventional TOKYO, and unspecified surfaces acquiring invented but plausible-looking inscriptions. For the reuse of digitised

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cultural heritage this is the central risk of generative AI stated exactly: left to itself, the model replaces the particular object in the museum with the typical object of its kind - and it is precisely the particular, not the typical, that a museum holds. The reference image is the countermeasure: it pins the artefact against reversion to type. This mechanism is now instrumented: a first automated measure - a detector for material reversion, comparing the colour signature of the artefact region in a generated frame against the source render - has been validated on the documented failure, scoring the known-failed fresh-green frames at 0.00 and the corrected golden-brown frames at 0.91-0.96. A general-purpose fidelity score, by contrast, was deliberately withheld: control measurements showed that a frame containing the wrong artefact of a similar material still scores highly, and a number that cannot distinguish the right object from a wrong one of the same material must not be published as fidelity. Both results, including the raw measurements, are kept so they can be recomputed or contested. Third, the certificate of provenance. Each finished scene ships with a machine-generated certificate stating what the scene asserts (with its source), what it deliberately does not assert, which digitised artefacts appear in which shots, and the practitioner's own measured calibration record - including mistakes kept on record rather than removed.



Empirica
CERTIFICATE OF PROVENANCE

SCENE CERTIFICATE
Olympia - The Crowning
REEVALUATE Pilot 2 - Olympia · 31 July 2026

This scene asserts one thing, and this document is where you check it.

The victor was crowned with a kotinos, an olive wreath, by the hellanodikai. Sourced (Pausanias, via Olympia Museum).

Caveat carried openly: Pausanias wrote in the 2nd c. AD about rites he may not have witnessed. The film shows what was recorded, not what was witnessed.

WHAT THIS SCENE DOES NOT ASSERT
- The faces of either man. The record does not describe them.
- That the wreath in frame is ancient. It is the Athens 2004 kotinos, a modern revival of the form - see SM_RV_16.not_asserted.
- The specific staging, the tear, the crowd's size. Dramatisation.

ASSET PROVENANCE — REAL OBJECTS, AND WHERE THEY CAME FROM

Every shot listed here was generated with the artefact's source render **attached as a reference image**, not described in words. The pipeline refuses to generate a shot that declares an artefact it cannot load.

ARTEFACT	SOURCE	IN SHOTS	WHAT MUST NOT CHANGE
Kotinos - olive wreath, Athens 2004 SM_RV_16	**Olympic Museum, REEVALUATE Pilot 2 digitisation (Unit 1)** The kotinos awarded to judoka Ilias Iliadis at Athens 2004 - the first Greek Olympic judo medal, won at **seventeen**. **Corrected against the source:** the Museum's own catalogue says eighteen, as does the Hellenic Olympic Committee. Iliadis was born 10 November 1986 and won the men's 81 kg final on 17 August 2004, so he was seventeen — three months short of eighteen. CNN's judo retrospective states the same ("an Olympic champion aged 17"). Where a certificate of provenance and its sources disagree, the certificate states the checkable fact and shows its working, so the reader can check it too. **An earlier revision of this certificate gave the date as 15 August; that was wrong and is corrected here. The age was unaffected either way, which is exactly why it needed catching rather than resting on.** **Not asserted:** This is NOT an ancient artefact. It is a 2004 revival of the ancient form. Nothing in frame should imply it was excavated or is of antiquity.	k1, k2, k3, k4	This is a REAL MUSEUM ARTEFACT and its geometry is the one thing that must not change. Keep it exactly as in the reference image: DRIED golden-brown olive, never fresh or green; narrow pointed lanceolate leaves densely packed along the stems, not broad rounded leaves; small pale buds scattered through; thin dark wire ties binding the stems at intervals; a pale cloth strip wrapping the join; and an OPEN ring where the two ends overlap rather than a closed circle. Same shape, same leaves in the same positions, same wire ties, same cloth binding, same open ring.

SHOT LEDGER

SHOT	TITLE	CARRIES	ON SCREEN
k1	THE CROWNING	hellanodikes, victor, SM_RV_16	The older judge stands behind and above the young athlete, holding the olive wreath raised in both hands just above the young man's head, about to lower it. The young man faces camera with his head slightly bowed.

Figure 64: The certificate of provenance of the scene 'The Crowning': every claim the scene makes, its source, and what is declared as dramatization.

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The certificates matter because the discipline catches discrepancies, and the production has a defined path for them. When a claim in the received material fails verification - or when generated output disagrees with a source - the affected claim is halted rather than shipped, and the discrepancy is escalated through Empirica's human decision gate to FFP for review. Verification then proceeds against independently checkable sources: public records and reference works are consulted, and where the question concerns the object itself, the digitised artefact is examined at magnification and treated as more authoritative than its catalogue entry. The outcome, whichever way it falls, is recorded with its evidence. The clearest case: the museum's catalogue states that the kotinos of Athens 2004 was awarded to judoka Ilias Iliadis at eighteen; verification against his date of birth (10 November 1986) and the competition date (17 August 2004) shows he was seventeen, and the certificate of "The Crowning" states the corrected fact and shows its working. This was not an isolated case but an instance of a recorded pattern - the artefact is more reliable than its metadata.

Among further discrepancies caught before publication: a ball catalogued as a volleyball that the digitisation shows to be a moulded water-polo ball; equipment filed as baseball gear that is softball gear; a medal whose catalogue text derived from a folder name, corrected by reading the inscription on the object itself at magnification (ΟΛΥΜΠΙΑ / ΑΘΗΝΗΣΙ / ΑΩΟ΄, the Greek numeral for 1870); and the near-conflation of two different athletes named Iliadis - a weightlifter of 1976 and the judoka of 2004 - caught before any shot shipped. The same discipline polices the generative model itself: a render that normalised TOKIO to TOKYO was rejected, as was a shot that fabricated a legible autograph on an object whose digitisation bears none. All discrepancies are compiled, with their evidence, into a report for the Olympic Museum as part of the pilot's feedback to the content-holding institution - the reuse pipeline thereby returns value to the collection it draws from, in the form of verified corrections to its own documentation.

3.7.3 Completed scenes and trailer status

Production proceeds scene by scene, and deliberately so: rather than assembling a single film in one pass, the production completes self-contained scenes - each built around one artefact carrying one sourced claim, each delivered with its master, its editing project file and its certificate of provenance - and demonstrates that the workflow repeats across artefacts before the scenes are cut together. The trailer and the final film are an edit of proven scenes, not a single fragile generation.

The first completed sequence, "The Crowning" (20 seconds, 1080p, four shots), depicts the crowning of a victor with the Kotinos by the hellanodikai - an act described by Pausanias - and reuses the digitised Athens 2004 Kotinos as its central artefact, openly declared as a modern revival of the ancient form rather than an antiquity. The two athletes are invented period characters, declared as such: their faces, which the historical record does not describe, are held consistent across all four shots through a portrait-reference technique. The scene is delivered as a finished master together with an industry-standard editing project file (FCP XML) and its certificate of provenance, so the material and its factual basis integrate directly into a conventional post-production workflow. "The Cutting of the Wreath" (16 seconds, four shots), reconstructs the cutting of the sacred branch at Olympia from the historical record and connects it to the digitised artefact: the wreath lifted in its final shot is the museum's kotinos itself. Together the scenes trace a single object from rite to museum across 2,700 years - the creative argument of the film in miniature. A further sequence, built to the same discipline around another artefact of the collection, is in production.

From the completed and forthcoming scenes, a trailer organises the material into up to five scenes, one per thematic unit of the Olympic Museum's exhibition concept, with rhythm as the connecting line, and integrates the historical recordings provided by SMB/SPK as the film's sound world. Each

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scene carries one provenance shot in which the artefact appears large and at rest and its claim is verified; motion and context shots compose the scene around it without bearing the provenance. In line with the pilot planning (D4.8), the film is completed within the second pilot iteration (M30-M34) and ahead of the opening of the Olympic Museum's immersive exhibition, planned for November 2026 (Section 2.2.6).

Shot-by-shot review board. The production is reviewed on a shared web page, the Olympia Master Storyboard, which presents every shot of the two trailer cuts beside the digitised museum asset it is built from (Figure 65). For each shot the page shows the generated frame on the left and the museum's original render of the artefact on the right, the artefact's inventory number (for example SM_RV_16), the storyboard line the shot realises, and its status: rendered, final, flagged or missing. The two assembled cuts, "The Flame Never Went Out" (Units 1 to 3 and 5) and "Every Sport Has a Sound" (Unit 4), are reviewed from the same page.



Figure 65: The Olympia Master Storyboard: shot counters and status legend of the shot-by-shot review board.

The page is generated from the production's own records rather than written afterwards as a presentation. Its purpose is fidelity checking at a glance: a reviewer who knows the collection can compare each frame with the object it claims to depict without opening any production files (Figure 66), and a comment entered on a card is recorded against the shot it concerns. This is how a discrepancy in the torch was caught: in shot a4 the generated torch carried an engraving that does not match the digitised object SM_RV_12. The reviewer compared the frame with the asset on this page and flagged it (Figure 67), after which the scene was regenerated with the torch shown form-forward and the inscription kept out of the light.

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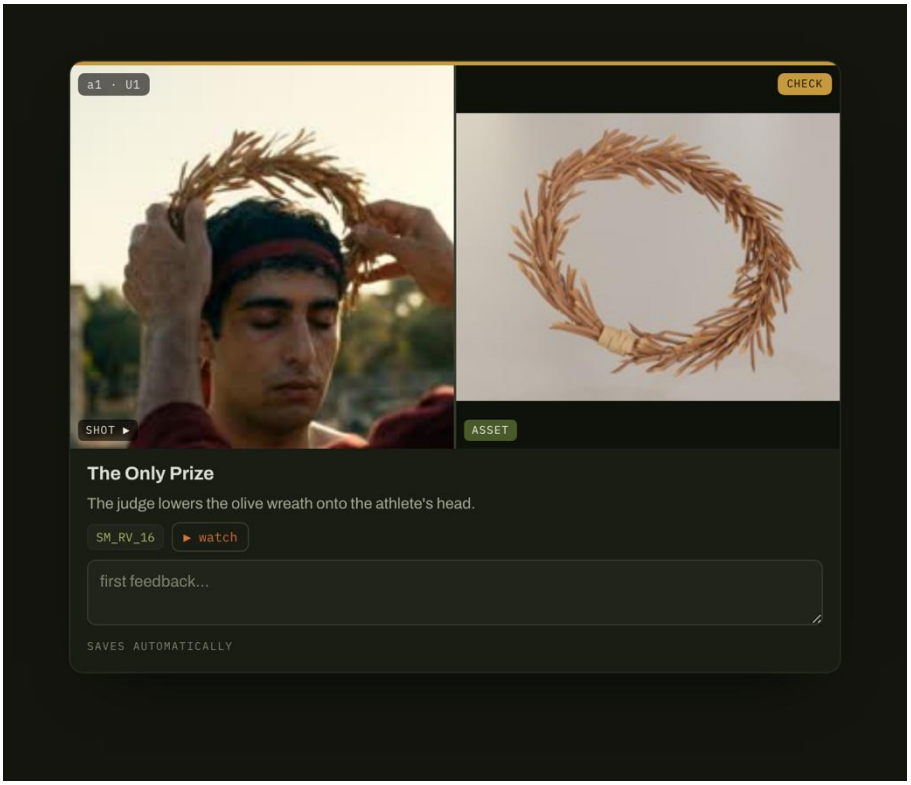


Figure 66: Review card for shot a1, "The Only Prize": generated frame (left) beside the digitised olive wreath SM_RV_16 (right), with inventory number and status.

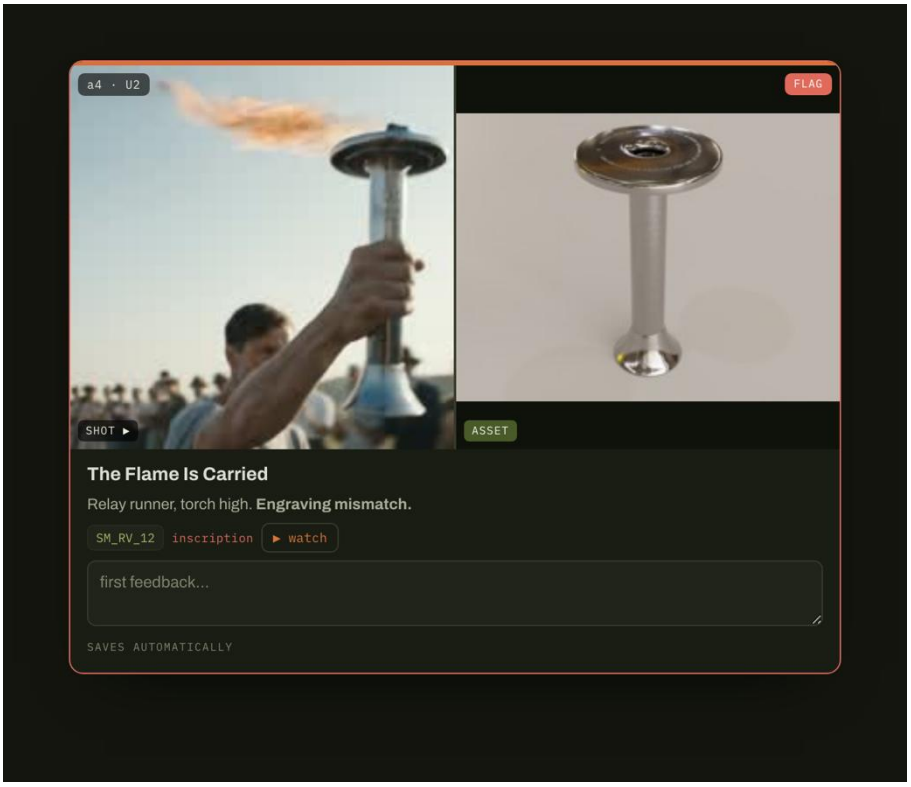


Figure 67: Review card for shot a4, "The Flame Is Carried": the fidelity flag on the torch engraving against the digitised torch SM_RV_12.

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At the time of writing the board holds 19 rendered shots built from the 23 digitised assets, one completed scene, one flagged shot and one clip still to be produced. The video clips are played from the production folder during review; the assembled cuts will be published online together with the finished trailer. The board is available at https://claude.ai/code/artifact/0cc069b9-e895-4d11-a4f1-69272d99ff42.

Beyond the project's duration, the production pipeline and the REEVALUATE enablers suggest a natural further integration, in which the enablers become stages of one connected, measured workflow. The Collaboration Enabler's multimodal search could serve as the pipeline's discovery layer, with the asset registry resolving artefacts and their invariants directly from the REEVALUATE Marketplace rather than from local deliveries. The DLT-based Asset Tokenisation & IPR Management Enabler could back the pipeline's existing refusal gate: a shot that declares an artefact would generate only once the smart contract confirms the rights for that use, making copyright compliance a machine-checked precondition of generation rather than a parallel process. The Contextualisation Enabler's enriched metadata in the REEVALUATE Knowledge Base could feed the sourced shotlists directly, so that every contextual claim a scene makes carries its Knowledge Base provenance. The Context Validation Enabler could act as an automated counterpart to the certificates of provenance, checking generated scenes for misuse, out-of-context presentation and inappropriate content - including deepfakes - before release. And the Public Sensing Prioritisation Enabler could bring audiences into the loop that today runs between practitioners and curators, letting public engagement guide which artefacts are taken into production next. None of this is committed within REEVALUATE; it is recorded here because the pilot's result - a measured production discipline on one side, validated enablers on the other - makes the connection between them the evident next step for exploitation beyond the project.

4 Conclusions & Outlook

This deliverable reports the results of the second pilot phase for the cultural asset reuse productions and applications across the three REEVALUATE pilots. Each pilot pursues a distinct approach to the creative reuse of digitised cultural heritage, while relying on a shared set of technical enablers developed within the project by the consortium partners.

Pilot 1 (Fashion) centres on a gamified application — the "Fashion Time Machine" — and a physical garment creation showcase, both drawing on digitised artefacts from the MoMu collection. The technical implementation by CERTH, using the SMPL-X body model and a Unity-based clothing pipeline, demonstrates how heritage assets can be transformed into interactive digital experiences. FFP exemplifies the REEVALUATE reuse chain in practice by merging the contributions from museum digitisation (MoMu/EFHA) and technical integration (CERTH) into the bespoke gamified application. The first tangible output of the pilot — a modernised sewing pattern ("Mildred") derived from a 1920s MoMu collection piece — has been published on the Fibre Mood platform and is available for purchase, and four further patterns are being prepared for the second pilot iteration.

For Release 2 the CERTH work has reached a working standalone build, first shown end to end in mid-June 2026. It consists of a walkable Virtual Museum showing the digitised artefact ST2202 together with a Curator assistant, and a try-on experience with two avatar engines: live motion capture on a UMA avatar, which runs on the local machine and stores nothing, and generative AI motion on an SMPL-X body, which runs on a server.

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Pilot 2 (Olympic Games and Music) delivers FFP's committed proof-of-concept advertising film, "Olympia", which reuses digitised artefacts from the Olympic Museum together with ethnomusicological material from SMB/SPK, developed with reference to the five thematic units elaborated by the Olympic Museum and presented within the immersive exhibition prepared by the Olympic Museum of Thessaloniki. The production is under way through an AI-assisted pipeline run under the open-source Empirica framework, in which every visual claim is anchored to the museum's documentation and each completed scene ships with a certificate of provenance (Section 3.7): the first scenes are complete, a working trailer assembly integrates the SMB/SPK recordings, and the film is completed ahead of the exhibition's planned opening in November 2026. Beyond the film itself, this production discipline — sources before generation, inventions declared, certificates per scene — is a transferable result for the creative industries' reuse of digitised heritage. Alongside the film, FFP created an extensive set of new 3D assets and a real-time multi-projector system to drive the Museum's exhibition spaces (Section 3.6). Any further material, such as additional thematic videos, remains a conditional enhancement, pursued only if person-months allow, and cannot be guaranteed at this stage.

Pilot 3 (Aquileia) focuses on site-level digitisation of the Titus Macer Domus and artefacts from the National Archaeological Museum, resulting in an interactive virtual tour accessible both on-site and remotely. The shared enablers — including the DLT-based Asset Tokenisation & IPR Management Enabler, the Context Validation Enabler, the AI-driven Contextualisation Enabler, and the Collaboration Enabler — have been tested across the pilots and have proven instrumental in managing copyright, validating contextual use, and facilitating cross-institutional collaboration.

Following the transition of lead beneficiary responsibilities from NURO to FFP (see Section 1), the consortium has successfully consolidated this deliverable, and the pilots remain on course despite the later submission explained in Section 1.1: testing continues as planned into autumn 2026, and Pilot 2's exhibition opens as scheduled. CERTH has played a key role in supporting both the technical implementation and the coordination effort. As the second and final release of this deliverable, D4.11 incorporates the outcomes of the second pilot phase and a more comprehensive evaluation of the reuse applications in public-facing settings. The remaining steps concern the completion of the Fashion Time Machine gamified layer, the completion of the advertising film "Olympia" from its proven scenes, and the public launch of the Aquileia virtual tour.

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Annex A - The five thematic units of the Olympic Museum exhibition concept:

UNIT 1: FROM DISCOVERY TO REVIVAL

The Rediscovery of Ancient Olympia In 1766, the ancient sanctuary of Olympia was brought to scholarly attention by the English antiquarian Richard Chandler. Subsequent excavations revealed temples, altars, stadiums, and artistic treasures, providing unprecedented insight into the cultural and religious life of ancient Greece. This rediscovery marked the first step in reconnecting the modern world with the Olympic tradition and laid the foundation for the revival of the Games.

Objective:
Introduce visitors to the rediscovery and evoke curiosity.

Visuals:
Panoramic shots of ruins being uncovered, archaeological drawings, maps showing Olympia's location, photos of the excavation, Card-postal.

Audio:
Ambient sounds of excavation; soft narration introducing Richard Chandler and the rediscovery.

Narrative focus:
Emphasize that Olympia had been lost to time and the rediscovery reconnects the modern world with ancient Olympic heritage.

The Ancient Olympic Games

From 776 B.C. to 393 A.D., Olympia hosted the most significant sporting, cultural, and religious festival of the Greek world. Athletes, musicians, poets, and spectators converged to honour Zeus in an integrated celebration of body, mind, and spirit. Music was inseparable from the Games: it accompanied the rigorous two-month training of athletes, coordinated rhythm and movement during competitions, and celebrated victory through hymns and epinikia. The olive wreath (kotinos), taken from the sacred tree of Zeus, was the sole prize for champions, yet it conferred unparalleled prestige. Victors were immortalized through statues and civic honours, receiving lifelong privileges in their hometowns, while poets such as Pindar recorded their achievements, blending historical, mythological, and civic narratives into lyrical compositions performed with lyre or aulos.

Objective:
Immerse visitors in the life, values, and multisensory experience of the Games.

Visuals:
Animated reconstructions of athletes training and competing, musicians playing lyre and aulos, spectators in ancient attire, significant figures, journey of the spondophoroi, Temple of Zeus in Ancient Olympia, Proclamation of the Sacred Truce

Audio:
Rhythm of music during training and contests, crowd reactions, narration describing Olympic rituals and events, victory songs (epinikia).

Narrative focus:
Athletic preparation and competitions. Role of music: coordinating movement, victory hymns

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(epinikia), presence of musicians. Victories: olive wreaths, statues, civic honours, and Pindar's victory odes. Ideals: excellence, honour, unity of sport and culture.

Romanticism and the European Revaluation of Ancient Greece In the 19th century, European Romanticism fuelled renewed interest in classical antiquity. Artists, writers, musicians, and scholars sought inspiration in the ideals, aesthetics, and ethical principles of ancient Greece, perceiving it as a model of harmony, excellence, and civic virtue. The rediscovery of Olympia exemplified the Romantic fascination with historical grandeur and provided a tangible link to a world that combined artistic, intellectual, and athletic achievement. Music and literature of the period frequently drew upon Greek mythology and philosophical thought to express universal human values, emphasizing the integration of culture, emotion, and education.

Objective:
Connect rediscovery to cultural fascination and European Romantic thought.

Visuals:
Philhellenic Paintings, Paintings by Delacroix, ancient Greek statues, music sheets, Romantic-era Greek landscapes, paintings, Card-postal

Audio:
Classical Romantic music inspired by Greek mythology, narration explaining the European interest in Greek heritage.

Narrative focus:
How Romanticism influenced art, music, and intellectual life. Ancient Greece as the model of harmony, heroism, and cultural excellence. Europe wanted to see the grandeur of the past with its own eyes. Archaeology becomes a science. The first missions arrive in Greece. In 1875, a German mission begins the excavation of Ancient Olympia. They discover the site of the first Olympic Games. The world looks once again to Greece. Rediscovery of Olympia as the symbol linking the past to modern imagination.

Evangelis Zappas and the Revival of the Olympic Spirit Evangelis Zappas, a Greek philanthropist and visionary residing in Romania, became instrumental in translating the Romantic admiration for Greece into concrete action. In 1859, he sponsored the first modern Olympiad in Athens, followed by subsequent Games in 1870, 1875, and 1889. The Zappas Olympiads sought to emulate the ancient Olympic ethos, combining athletic competition with music and cultural celebration. Participation was guided by ideals of honour, excellence, and fair competition (εὖ ἀγωνίζεσθαι), rather than financial reward. These Games, while exclusively Greek in character, demonstrated that the Olympic tradition could be revived, establishing a cultural and moral precedent that would later influence the international Olympic Movement.

Through the rediscovery of Olympia, the cultural and athletic achievements of antiquity were illuminated; through the Zappas Olympiads, these ideals were reactivated, bridging the gap between ancient tradition and the aspirations of the modern world.

Objective:
Show how the Olympic spirit was revived.

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Visuals:
Zappas Olympiads to early modern Olympic imagery, symbolic lighting effects evoking continuity, athletes competing, detailed shots from the opening ceremony, the distinction between amateur and professional athletes, the athletes' oath, medals, and anthems.

Audio:
Period-appropriate music, narration describing Zappas' vision, crowds cheering, ceremonial elements, Soutsos' poem, Triumphant music gradually merging ancient and modern motifs; narration highlighting enduring values.

Narrative focus:
Evangelis Zappas' role and vision. For the first time in history, the Zappeion Olympics introduced significant elements like the distinction between amateur and professional athletes, medals, diplomas, sports attire and opening and closing ceremonies. Games guided by ancient-Olympic ideals: honour, fair competition, integration of sport and culture. Significance for Greek national identity and as a precursor to modern Olympics. Inclusion of music alongside athletic events to emphasize cultural revival. Rediscovery → antiquity → revival → continuity. Although the Zappeion Olympics had a national character, they became the starting point for the modern Olympic Idea and played a decisive role in the revival of the Olympic Games.

UNIT 2: THE FIRST MODERN OLYMPIC GAMES – THE REVIVAL & THE OLYMPIC SYMBOLS

The revival of the Olympic Games - 1st modern Olympic Games - Athens 1896: Pierre de Coubertin is regarded as the official reviver of the Olympic Games. His vision was not just to revive the institution, but to highlight the ancient Greek tradition of connection between art and sport, reflecting the principle of Olympic movement. The Olympic Games were therefore revived at the first Olympic Congress, organised by Baron Pierre de Coubertin and held at the Grand Amphitheatre at the Sorbonne University from 16 to 23 June 1894. Two thousand people attended, including 58 French delegates representing 24 sports organisations and clubs, and 20 delegates from Belgium, Great Britain, Greece, Ireland, Italy, Russia, Spain, Sweden and the United States representing 13 foreign sports federations. As the congress came to an end on 23 June, the Olympic Games were officially reborn and the International Olympic Committee created.

In 1906, Coubertin introduced the Pentathlon of Muses, a competition in sculpture, painting, music, literature, and architecture, but it wasn't until the 1912 Stockholm Games that arts competitions were officially held alongside sports and remained until 1948 London Games.

The revival of the Olympic Games, spearheaded by Pierre de Coubertin, reflects the deep connection between Romanticism and the ancient Greek tradition. Inspired by the values of ancient Greece, Coubertin believed that the rebirth of the Olympic Games could serve as a bridge for cultural and political reconciliation, promoting peace through sports. In 1896, the first modern Olympic Games were held in Athens, a poignant tribute to the country that gave birth to the institution.

Coubertin's Olympic ideal was based on three fundamental principles:

The moral dimension of sports – Athletics is not just physical exercise but a means of shaping character and values.

International brotherhood – The Games are not a battleground for nations but an opportunity for peaceful coexistence.

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Amateurism – Sports should remain pure, free from commercial and material interests, as was the case in ancient Greece.

The phrase attributed to Coubertin, "The most important thing in the Olympic Games is not to win but to take part," perfectly encapsulates his philosophy, which draws its origins from the principles of ancient Greek athletics.

THE FIRST MODERN OLYMPIC GAMES

Objective:
Introduce the historical revival of the Olympic Games, highlighting Pierre de Coubertin's and Dimitrios Vikelas vision and the first modern Games in Athens 1896.

The Olympic Revival – Paris 1894

Visuals:
Historical images or animated reconstructions of the Sorbonne Congress, delegates debating, maps showing participating countries, External shot of the Sorbonne building, decorated with flags from various countries, with the sunlight falling on it, Letter from the Panhellenic Gymnastic Association, from President Ioannis Fokianos to Vikelas, Coubertin and Vikelas shaking hands, The delegates at the foyer

Telegram from Vikelas to Ioannis Fokianos, President of the Panhellenic Gymnastic Association

Audio:
Ambient crowd murmurs, soft classical music, narration introducing Coubertin, excitement fills the room, applause breaks out

Narrative focus:
In the summer of 1894, the heart of Europe beats in Paris, at the historic Sorbonne. There, for the first time, people from around the world gather with the same passion and vision: to revive the ancient flame of the Olympic Games. History calls upon Dimitrios Vikelas, the Greek intellectual, to undertake a mission beyond the borders of his homeland. From the Panhellenic Gymnastic Association, with the signature of President Ioannis Fokianos, arrives the invitation – an invitation to participate in the conference that will decide the revival of the Olympic Games. Dimitrios Vikelas, with the calm and determination that characterized him, takes the floor. Without fear or doubt, he proposes the boldest step: that Athens, the city of the Olympic Games, once again become the center of the world for athletic harmony and the spirit of freedom. The partnership between Pierre de Coubertin and Dimitrios Vikelas becomes the force that connects the past with the future, the dream with reality. Humanity will forever have Athens, the birthplace of Olympism, as a symbol of global peace and excellence.

Athens 1896 – The First Modern Olympic Games

Visuals:
Animated reconstruction of Athens stadium, athletes preparing, spectators arriving, Artist's painting, sculpting, composing music; performances alongside athletic competitions.

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Audio:
Crowd cheering, trumpets, rhythmic footsteps, narration describing the opening, Classical music, sounds of brushstrokes or sculpting, audience murmurs.

Narrative focus:
Highlight the three principles of Coubertin: moral dimension of sport, international brotherhood, and amateurism; first modern Games as a tribute to Greece. Show how Coubertin linked athletics with arts, inspired by ancient Greek ideals and Romanticism; demonstrate cultural integration.

Olympic Symbols:
Olympic symbols are central to the identity and meaning of the Olympic Games, representing the values of excellence, friendship, and respect, and promoting the idea of a peaceful and united global community through sport.

1. The Opening Ceremony - Nations Parade

Visuals:
Parade of nations entering the stadium, flags waving, Greece entering first.

Audio:
Marching music, trumpets, cheering crowds, music from the opening ceremonies

Narrative focus:
The Opening Ceremony of the Olympic Games is a grand and symbolic event that marks the official beginning of the Games. It is a highly choreographed celebration filled with tradition, spectacle, and the Olympic values of unity, peace, and excellence. In the 1924 Paris Olympics we had the first modern Opening Ceremony. The event featured the first official parade of nations, athletes marching in order according to their country's names. Greece always gets into the stadium first, as an honour to the birthplace of the games. The Nations Parade during the Opening Ceremony of the Olympic Games is one of the most iconic moments of the event. It is a symbolic procession where athletes from all participating countries march into the stadium, representing unity, peace, and global cooperation through sport.

2. The Olympic Rings:

Visuals: Animated Olympic rings, vinted colors of the 5 circles

Audio: Orchestral music, crackling flame

Narrative focus: The five rings represent the five inhabited continents: Africa, the Americas, Asia, Europe, and Oceania. The interlocking of the rings symbolizes unity and the coming together of these continents in peaceful competition. The colours were chosen because every nation in the world could find at least one of these colours in their flag.

3. The Olympic Flame:

Visuals:
Torch lighting, relay across continents, torch relay forming symbolic shapes

Audio:
Orchestral music, crackling flame

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Narrative focus:
The flame symbolizes the unity of the people, the pursuit of excellence, and sends the message of the Olympics ideals. The torch relay, which brings the flame from Olympia to the host city, represents the passing of Olympic values from one generation to the next.

4. The Olympic Motto – Flag – Anthem and Oath:

Visuals:
Athletes in motion, flag raising, anthem performance, athlete taking oath with official.

Audio:
Anthem music, ceremonial drums, narration emphasizing solemnity and ethics.

Narrative focus:
The motto represents the aspiration of the Olympic athletes to push their physical and mental limits, aiming for excellence in sport. It encourages athletes to strive for personal improvement and achieve their best.

Narrative focus:
The flag symbolizes the unity of the five continents and the global nature of the Olympic Games. It is flown during the Games and in Olympic venues around the world.

Narrative focus:
It is a symbol of the unity and peace that the Olympic Games aim to promote. The anthem represents the ideals of Olympism and is performed whenever the Olympic flag is raised.

Narrative focus:
The oath represents fair play, integrity, and respect for the Olympic values. It emphasizes the importance of ethics and sportsmanship in the Games.

UNIT 3: THE MESOLYMPIC GAMES "ATHENS 1906"

As a result of including the organization of the Olympic Games "PARIS 1900" and "ST. LOUIS 1904" during the period of International Exhibitions, the future of the Olympic Games was uncertain, as the popularity and the numbers of athletes and spectators were rapidly decreasing. The limited success of the two Olympic Games concerned the Greek athletic spirit. On the 10th anniversary of the revival of the modern Olympic Games (1896-1906), Greece claimed and undertook the organization of the "International Olympic Games" of 1906, which became known in history as the "Mesolympic Games", as they were held in between the scheduled Olympic Games of 1904 and 1908. The "International Olympic Games" were held from April 22nd to May 2nd, 1906, following the template of the flawless "ATHENS 1896". The scent of success of the 1896 Olympic Games created a new atmosphere of euphoria among foreign athletes and visitors, but especially among Greeks.

The final decision for Greece to organize the Olympic Games for the second time in modern era was taken in 1904 and the whole 1905 was devoted to the preparation of the Games. Athens, the city that hosted the 1906 Games, had changed a lot compared to Athens in 1896. It had been modernized and specially designed to welcome this great sporting event, with the main streets having been paved and lit by electricity, and the Athens-Piraeus railway and trams having been electrified. Especially for the Games, the city was decorated with flowers, colourful lamps, flags, blazons of all nations and signs in all languages. For the first time in the history of the modern Olympic Games, athletes participated through the National Olympic Delegations in teams, parading in the Panathenaic Stadium under the

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flag of their country, a ritual that was repeated in the following Olympic Games ''LONDON 1908''. Especially for Greece, that moment was particularly moving, since the Greek Olympic delegation includes Greek athletes for regions beyond the frontiers, as Crete, Macedonia, Cyprus and Smyrna.

The Mesolympic Games was attended by 903 athletes, coming from 21 countries and, according to newspapers of the time, around 20,000 visitors arrived in Athens. The opening of the Games took place at the Panathenaic Stadium, in the presence of King George I, King Edward of Great Britain and 75,000 spectators, almost all Athenians. The foreign athletes stayed in the Zappeion Hall, the first Olympic Village in the history of the Games. With great enthusiasm and following the great success of Spyros Louis, winner of the marathon race of the 1st Modern Olympic Games ''Athens 1896'', the spectators hoped again for a Greek winner. However, the 1st place was deservedly won by the Canadian William Sherring. In the poster, which was released after the Games, Spyros Louis congratulates William Sherring, while the goddess Nike raises two kotinoi, wreaths of sacred olive branches, signifying the victory of the two Olympic Winners. Regarding the results of the 1906 Games, Greece's expectations for the performance of its athletes were confirmed with 7 first, 17 second and 15 third places, even though medals for the first and second place were only awarded. Furthermore, apart from medals, finest cups crafted by remarkable sculptors, such as Greek sculptor Georgios Demetriades, also were given as prizes to athletes in many sports during the Mesolympic Games of 1906.

The success of the Olympic Games is usually connected to the number and the performance of the athletes, the number of visitors and distinguished people who travel to watch the Games, the operation of the sports facilities and the overall organizational structure. Therefore, from every point of view, the 1906 Games were organized in an exemplary way by Greece and were a complete success, giving new impetus to the Olympic movement and contributing to the enhancement of the Olympic Games' prestige.

THE MESOLYMPIC GAMES "ATHENS 1906"

Objective: Showcase the Mesolympic Games' achievements, organization, and significance in reviving the Olympic spirit.

Visuals:
Athens cityscape in 1905, construction of stadiums, decorated streets, electrified trams, flags, Panathenaic Stadium filled with spectators and athletes, royal guests in attendance, Canadian William Sherring winning the marathon; Greek athletes performing well in multiple disciplines, Medals, cups as awards, wreaths (kotinoi), poster showing Spyros Louis congratulating Sherring, card postal, newspapers.

Audio:
Sounds of construction, bustling city, tram bells, soft celebratory music, rhythmic sounds of running and competition, narration of notable winners and achievements, audience applause, uplifting orchestral music summarizing the success.

Narrative focus:
Highlight Athens' modernization and meticulous preparation to host the "International Olympic Games" successfully, building excitement and national pride. Present the historical significance of national delegations and the emotional impact for Greek athletes representing regions beyond modern Greece. Highlight performances, athlete diversity, and moments of fair play, illustrate Greek hopes and international participation. Emphasize the symbolism of awards, continuity with ancient traditions, and cultural artistry integrated into the Games. Show how the exemplary organization,

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athlete participation, and public enthusiasm restored prestige to the Olympic Games and strengthened the Olympic Movement.

UNIT 4: OLYMPIC VALUES THROUGH SPORTS & MUSIC

Sports, music, and rhythm are intricately woven together, with the equipment in each sport playing a key role in shaping the pace, movement, and atmosphere. Just as music is composed of beats and tempo, the rhythmic sound of sports equipment in action provides a natural soundtrack for the game. As the equipment used in various sports often influences the timing, flow, and energy of the game, much like how music sets the tempo of a performance. The equipment used in sports not only serves a functional purpose but also contributes to the musicality and rhythm that elevate the athletic experience. For example, the rhythmic sound of a basketball bouncing on the court or the swift crack of a tennis racket hitting a ball creates a dynamic beat that mirrors the pulse of the game.

Sports, music, and rhythm are deeply interconnected, transforming athletic movement into dynamic and artistic performances. The rhythm of sport extends beyond the body itself, shaped also by the equipment athletes use. From the controlled timing of a golf swing to the rapid beat of a sprint, equipment adds its own cadence, influencing both pace and precision. In individual sports, the sounds produced by equipment—whether the crack of a racket, the thud of a ball, or the swish of a ski—intensify the rhythm of performance, heightening both the athlete's focus and the spectator's experience. In team sports, music often plays a unifying role, fostering synchronization, coordination, and collective energy, turning play into a shared rhythmic experience. Yet rhythm in sports is not always marked by sound. Silence itself can become a powerful element, building anticipation, heightening emotion, and shaping the rhythm of competition through pauses and moments of stillness. Together, movement, equipment, sound, music, and silence create a layered rhythm that defines the emotional and artistic dimension of sport.

1. Interaction Between Sports, Music, and Rhythm:

This category explores the fusion of sports with music and rhythm, which elevates the overall athletic experience. Music and rhythm don't just add an auditory layer to sports—they shape the flow of movement, turning physical actions into expressive, almost artistic performances. This synergy enhances the visual appeal and emotional depth of the sport, as athletes move in time with the beat or rhythm of the event.

The integration of rhythm in sports (whether from equipment, natural movement, or music) turns athletic performance into more than just competition—it becomes a dynamic, artistic expression that draws both emotional and aesthetic connections from the audience.

Objective:
Emphasize how sports equipment acts as both functional tools and sources of rhythm and sound.

Visuals:
Slow-motion of athletes moving in harmony with rhythmic beats; overlays of musical notes blending into athletes' movements.

Audio:
Layered beats, combining natural sport sounds with musical rhythm (e.g., basketball dribble merges with drumbeat).

2. Role of Equipment in Sports (materiality and sounds):

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The equipment in sports not only serves a practical function but also contributes to the rhythm of the game. For example, in golf, the precise timing and swing rhythm required to strike the ball with accuracy creates a sense of pacing, while in sprinting, the rhythmic pounding of feet on the track sets a fast, intense tempo. Equipment influences the flow of the game and dictates the timing of movements, helping to synchronize an athlete's actions with the rhythm of the sport.

In this category, sports equipment functions like a metronome or musical instrument, producing sounds or guiding movements that create a sense of rhythm. Whether it's the sound of a bat hitting a ball or the quickness of a swimmer's stroke, the equipment becomes integral to the sport's rhythm.

Objective:
Emphasize how sports equipment acts as both functional tools and sources of rhythm and sound.

Visuals:
Close-ups of equipment in use—golf swings, sprinting shoes striking the track, tennis rackets hitting balls.

Audio:
Clear, sharp equipment sounds (crack of a bat, thud of a ball, rhythmic footfalls).

3. Individual Sports and the Sounds of Equipment:

In individual sports, the sounds of the equipment become an essential part of the experience. In fencing, the clash of swords produces a sharp, rhythmic sound that matches the intensity of the contest. In cycling, the whir of the wheels and the clicking of the gears contribute to a mechanical rhythm, while in boxing, the sound of punches landing and the rhythmic movement of the boxers create an auditory pulse that matches the speed and power of the fight. In wrestling or tae-kwon-do, the sounds of bodies colliding and the strikes echoing across the arena provide a rhythm that both athletes and spectators can feel.

The sounds produced by the equipment in these individual sports add an auditory dimension to the experience, providing a rhythm that enhances the athleticism and emotional intensity. The equipment is both a tool for performance and a source of rhythm that shapes the flow of the sport.

Objective:
Highlight how the auditory dimension of equipment enhances intensity and rhythm in solo competitions.

Visuals:
Fencers clashing swords, cyclists in motion, boxers exchanging strikes, wrestlers grappling.

Audio:
Metallic clinks of swords, whirring wheels, rhythmic punches, echoing body collisions.

4. Team Sports and Communication Through Music
(cooperation, respect to my co-athlete. co-musician, the role and importance of the team, the respect to rules):

In team sports, such as rhythmic gymnastics or synchronized swimming, music is a central element that helps coordinate and synchronize the athletes' movements. The athletes are not only working together to achieve a common goal but are also moving in harmony with the beat of the music. This synchronization requires precise timing, and the rhythm of the music helps establish a common pace

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for all participants. The rhythm becomes a means of communication, allowing athletes to instinctively respond to each other's movements, fostering cooperation and unity.

Music in team sports functions as a rhythm that connects athletes, helping them to cooperate and communicate non-verbally. The shared rhythm unites the team, turning their movements into a synchronized performance that combines athletic skill with artistic expression.

Objective:
Show music as a unifying rhythm that enables cooperation, respect, and synchronicity in team events.

Visuals:
Synchronized swimming, rhythmic gymnastics, rowing crews moving in harmony, team huddles before play.

Audio:
Coordinated beats, team chants, music syncing movements, cheering.

5. Silent Moments in Sports and Emotional Soundscapes:

Not every moment in sports is filled with sound from the equipment or music. Silent moments—like a tense pause before a critical shot or a still moment during a race—can be just as thrilling as the most action-packed sequences. These silent moments are often charged with emotion, as the athletes prepare for a pivotal action or moment of decision. Even without sound, the intensity, anticipation, and emotional stakes are palpable, creating an invisible rhythm that builds suspense. The emotional energy of these moments can often feel like an unspoken beat or pulse that resonates with the audience.

Silence, in its own way, contributes to the emotional rhythm of the sport. These moments heighten tension and draw the audience deeper into the experience, allowing the emotions of the athletes and the spectators to fill the void. The emotional undercurrent becomes an integral part of the rhythm, even without an auditory cue.

Objective:
Demonstrate how silence builds anticipation and adds emotional rhythm to sport.

Visuals:
A sprinter before the start, a tennis player preparing to serve, the breath of a weightlifter before the lift.

Audio:
Silence, amplified heartbeats, deep breaths, followed by sudden eruption of sound at the moment of action.

Olympic Values:
The Olympic values are core principles that underpin the Olympic movement and guide athletes, officials, and spectators throughout the Olympic Games. These values promote the positive aspects of sport and foster a spirit of peace, unity, and respect. The three main Olympic values are: Respect, Excellence and Friendship. These three core values are integral to the Olympic philosophy and serve as a guide for athletes and all involved in the Games, encouraging them to uphold these ideals in their personal and professional lives. They form the foundation of Olympism, a philosophy that seeks to promote peace, understanding, and personal growth through sport. Together, these values form the essence of Olympism—sport as a path to peace, unity, and human progress.

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Objective: Convey the three core Olympic values—Excellence, Friendship, and Respect—as the ethical foundation of the Games, inspiring athletes and audiences alike.

Visuals:

Excellence:
Athlete's training, breaking limits, crossing finish lines.

Friendship:
Competitors embracing, exchanging flags, celebrating together.

Respect:
Handshakes, bows, gestures of sportsmanship, caring for the environment.

Audio:
Orchestral and uplifting music, with shifts in tone for each value—intense for Excellence, warm for Friendship, calm and steady for Respect.

Narrative focus:

Excellence:
Striving to give your best and grow beyond limits.

Friendship:
Building bonds across cultures and borders.

Respect:
Honouring yourself, others, and the rules of the game.

UNIT 5: INTERNATIONAL OLYMPIC DAY - A GLOBAL MOVEMENT

OLYMPIC DAY RUN - A WORLDWIDE CELEBRATION

The cultural events that take place during the interval of the Olympic Games are an important aspect of the modern Olympic tradition. Although the Games have their primary focus on sports, cultural activities incorporate the spirit of unity among nations and promote culture, art, and creativity, enhancing the experience of the Olympic Games on a global level.

It was in 1947 during the 41st Session of the International Olympic Committee in Stockholm, that Doctor Gruss, IOC member in Czechoslovakia, presented a report on a World Olympic Day celebration which would primarily be a day of promoting the Olympic idea. The first Olympic Day was celebrated on 23 June 1948. Olympic Day is not just a date on the calendar, but a universal celebration of humanity's shared aspirations. Each year on June 23, the world comes together to honor the birth of the modern Olympic Movement and to reaffirm the timeless values that lie at its heart: excellence, friendship, and respect. It is a day that transcends borders and generations, inviting people everywhere to discover the joy of movement and the unifying spirit of the Games. Olympic Day is a global celebration of sport and getting active. It takes place on 23 June each year to commemorate the day the International Olympic Committee was founded in 1894 - the birth of the modern Olympic Games. With more than 200 countries of the world participating in the celebration and more than 40,000,000 participations per year, the International Olympic Day is the largest mass participation sports event in the world and makes the heart of the planet ... beat with Greek rhythms.

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The Olympic Day Run can be considered as the core activity of Olympic Day. First launched in 1987, it has been organized by NOCs to celebrate Olympic Day and promote the practice of mass sport. From 45 participating NOCs in the first edition in 1987, the numbers have grown to more than 150 participating NOCs. At the center of this global celebration stands the Olympic Day Run, an open invitation for everyone — regardless of age, background, or ability — to participate in a simple yet powerful act: running together. It is not a competition but a collective journey, a symbol of health, inclusion, and solidarity. In every stride, participants affirm that sport is a language all can speak, a bridge that connects communities across continents. For a few kilometers, the world runs as one.

In Greece, the Olympic Day Run resonates with a unique depth. Held in the land where the Olympic ideal was born, it is more than a sporting event; it is a living dialogue between past and present. Ancient heritage meets modern celebration, and the ideals that first inspired the Games are reawakened in today's society. By opening its streets to runners of every age, Greece transforms the Olympic Day Run into a festival of unity, joy, and collective identity.

Since 2018 and every year, the "Olympic Day Run" GREECE, the only Olympic Running Race in Greece is organized. Olympic and Paralympic medalists, as well as representatives of the international and Greek Olympic institutions join the supreme running event with top runners and active citizens of the world, to raise Greece even higher on the global Olympic and sporting map. The Thessaloniki Olympic Museum - founding member of the World Network of Olympic Museums and official body for the promotion of the global Olympic heritage and Olympism as a philosophy and way of life - is the responsible body for the planning and implementation of the celebration in Greece, as well as the headquarters of the mega sport event / Olympic running Race.

The purpose of this unit is to immerse visitors in the spirit of Olympic Day, enabling them to feel part of a worldwide celebration of unity, health, and hope. The space is designed not only to inform but also to inspire, inviting the public to personally connect with the values of the Olympic Movement. Visitors leave with the understanding that Olympic Day is not merely an anniversary but a living tradition that demonstrates the power of sport to bring people together across cultures and generations. By highlighting the Olympic Day Run as a symbolic act of inclusion, this unit encourages reflection on how simple actions — such as running side by side — can express solidarity, foster friendship, and create bonds that transcend boundaries.

Objective:
Present the creation of Olympic Day, its purpose, and its global reach as a unifying celebration of sport and humanity. Highlight the Olympic Day Run as the core expression of Olympic Day, emphasizing both its global impact and its special resonance in Greece, birthplace of the Olympic ideal.

Visuals:
Archival photographs, Maps highlighting participation worldwide, with crowds running in different continents, global scenes of Olympic Day Runs across cities and landscapes, diverse participants: children, elderly, Olympic and Paralympic athletes, families, streets in Greece filled with runners celebrating Olympic Day through Olympic Day Run Greece, blending images of ancient heritage and modern festivity.

Audio: Warm, uplifting orchestral

Score building gradually to global scale, Soundscape of cheering, rhythmic footsteps, and voices in different languages, happiness of participation, pulse of running teams, rhythmic pulse of footsteps forming a collective beat, layered with cheers and applause.

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Annex B: "The Cutting of the Wreath"

Scene: The Cutting of the Wreath. Four shots, approximately 16 seconds. Setting: Olympia, the sacred grove and the Temple of Hera. Every element below is from the documented record (Pausanias, via the Olympia Museum). Nothing is invented; what the record does not specify is left unstated or deliberately abstracted (see the honesty notes at the end).

The locked style block applied verbatim to every shot so that separately generated shots cut together as one scene: "Desaturated teal-and-amber grade. Warm low sun against cool stone shadow. Crushed blacks, filmic highlight rolloff, fine grain. Long lens, shallow depth of field. Visible dust and fine particulate in the light. Ancient, sparse, reverent. No modern detail of any kind. No text."

SHOT 1 - THE TREE (~4s, wide, slow push-in). The Elaia Kallistephanos - a single ancient wild olive, gnarled and silver-leaved, standing alone beside the flank of the Temple of Zeus. Low sun rakes through the leaves. The grove is still.

Claim: the wreath came from one specific sacred tree growing beside the Temple of Zeus at Olympia. Sourced.

SHOT 2 - THE GOLDEN SHEARS (~4s, tight, locked off). A boy's hands close a pair of golden shears on a slender olive branch. The cut is clean and unhurried. Sunlight catches the gold.

Claim: branches were cut by a pais amphithales - a boy with both parents living - using golden shears. Sourced.

Not shown: his face, his clothing. The record does not describe them.

SHOT 3 - THE GOLD-AND-IVORY TABLE (~4s, slow lateral drift). Inside the Temple of Hera. Cut branches are laid on a table of gold and ivory. Shafts of light fall between columns. Nothing else moves.

Claim: the branches were carried to the Temple of Hera and placed on a gold-and-ivory table. Sourced.

SHOT 4 - THE CROWN (~4s, locked off, the wreath rises). The finished kotinos is lifted from the stone by the hands of a Hellanodikes in a deep-red chiton. This shot uses the real digitised artefact: SM_RV_16, the Athens 2004 kotinos.

The turn: Shot 4 is where the film reveals itself. The wreath just lifted is not ancient - it was cut for Ilias Iliadis, aged 17, at Athens 2004, the first Olympic medal in the history of Greek judo. The ancient rite and the modern object are the same gesture, 2,700 years apart.

Honesty notes (what the scene is not asserting): Pausanias wrote in the 2nd century AD about a rite he may not have witnessed - the scene presents what was recorded, not what was filmed by a witness. The boy's appearance, dress and age are unrecorded - kept out of frame. The table's form beyond "gold and ivory" is unrecorded - kept abstract. Whether the 2004 wreath used wild olive from Olympia specifically is unverified and is logged as an open assumption.

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