

MUSED VIRTUAL MUSEUM TOOLKIT

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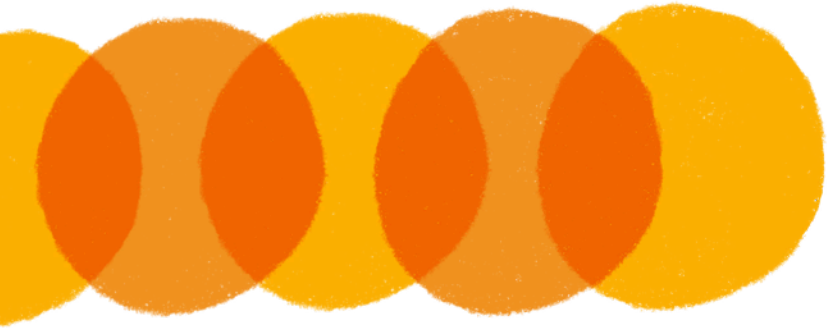
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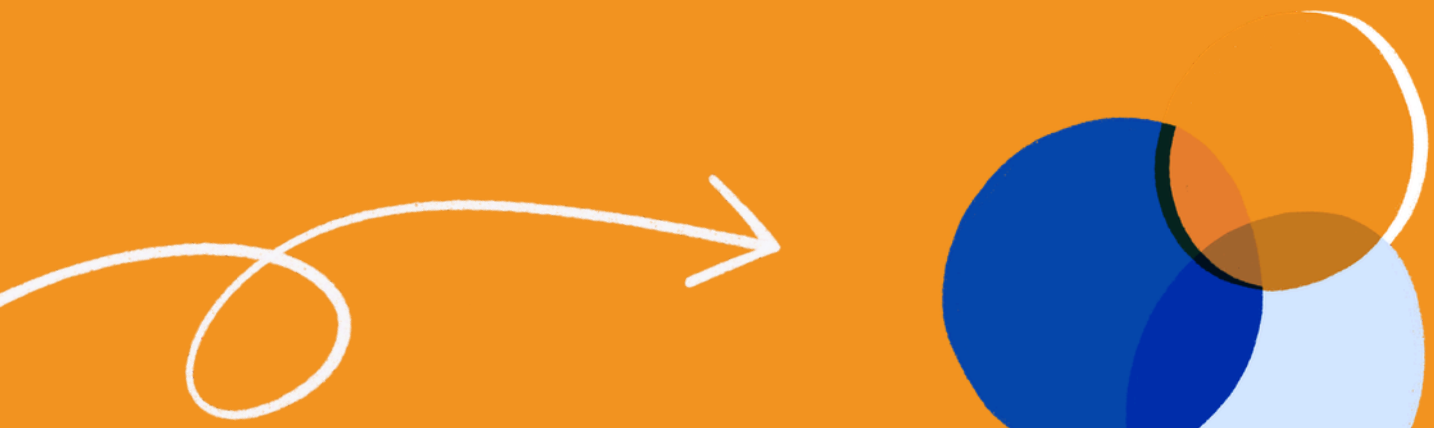




















CONTENT MAP

First Steps: Using the Toolkit and Guide Together
Guide Introduction and basic functions

1 **Ideas and Audience**
Defining purpose and target of virtual gallery

2 **Preparing Multimedia Content**
Guide users selecting and preparing digital assets

3 **Labels and UNESCO Categories**
Ensuring meaningful and standardized metadata and descriptions

4 **Designing the Virtual Gallery**
Principles and layout strategies of the virtual museum

5 **Hands-On Example with Spatial**
Practical application with a popular tool

6 **Accessibility for Everyone**
Ensuring inclusivity in design and content

7 **Checks and Risks**
Final reviews and risk management

8 **Small Technical Examples**
Concrete, localized examples to inspire and educate

INTRODUCTION





WHY WE NEED THE TOOLKIT

The Toolkit is designed as a practical complement to the “Digital Museum Learning and Engagement Guide,” since it is not a stand-alone resource but part of a dual system: while the Guide provides conceptual and pedagogical directions, the Toolkit translates them into practical workflows, technical standards, and examples. A quick content map organizes the Toolkit into eight thematic chapters, each focusing on distinct but interconnected steps of developing a virtual museum — from defining ideas and preparing multimedia, to ensuring accessibility, testing, and final dissemination. The structure reflects a progressive workflow, where partners have contributed specific expertise at each stage.

The first chapter analyses the aims of a virtual museum.

The Virtual Museum transforms education by making learning interactive, allowing users to move from passive observers to active explorers, engaging with 3D objects, videos, sounds, and multimedia narratives. It democratizes access to culture, enabling students and teachers from any location or background to enjoy high-quality heritage content. It also supports active methodologies like project-based learning, guided research, and peer collaboration, encouraging young people to contribute their own stories and digital creations. The platform integrates interdisciplinary knowledge across History, Arts, Sciences, Technologies, and Civic Education, fostering dynamic and meaningful lessons. The Virtual Museum promotes local identity and cultural diversity, helping students to connect with their own communities while discovering other European cultures, fostering empathy and intercultural dialogue. By creating content, students develop digital and media literacy skills, learning to research, select, produce, and communicate information critically. Accessible and adaptable, the platform accommodates different learning paces and provides inclusive resources. In short, the MUSED Virtual Museum serves as a living archive of cultural heritage and a digital learning lab, designed to engage, motivate, and inspire students, teachers, and communities. It reinvents teaching and learning about heritage, bringing the past closer to the present and future in an interactive, inclusive, and collaborative way.

The second chapter serves as a foundational guide for creating high-quality multimedia content for the MUSED project,

which aims to make European cultural heritage accessible to a diverse audience.
It emphasizes that accessibility is a core design principle and not an afterthought.
The guide covers a step-by-step approach for producing various types of digital assets:
2-D Photographs, 3-D Models, Audio, Video.

Chapter 3 discusses the cultural and natural heritage of the world and UNESCO's aims.

The heritage includes the places, traditions, and environments that show the richness of human history and the beauty of nature. To protect this heritage, UNESCO created the World Heritage Convention in 1972. Today, 195 countries have agreed to follow this convention.

UNESCO classifies heritage into three main types:



This includes historical buildings, monuments, archaeological sites, and landscapes shaped by people.

These are places with special natural beauty, unique wildlife, or important geological features.

These sites have both cultural and natural importance.

UNESCO also supports two other important programs:

Intangible Cultural Heritage:

This protects living traditions like music, festivals, rituals, crafts, and oral stories passed down from generation to generation.

Memory of the World:

This program works to preserve important documents, books, and archives that tell the story of humanity.

Chapter 4 focuses on designing an engaging and inclusive virtual gallery.

It emphasizes creating smooth visitor flow through rewarding exploration and interactive tasks, making the experience motivating and educational for all users, including those with disabilities. Visual elements like adjustable lighting, 3D models, and multiple viewpoints enhance immersion and accessibility. Clearly, simplified captions and alt text ensure effective communication for diverse audiences, supported by AI tools for adaptability. Sound design and multimedia pacing further personalize the visit, accommodating sensory sensitivities and promoting understanding. Overall, the chapter highlights the importance of combining inclusivity, interactivity and thoughtful design to create a meaningful and accessible digital museum experience.

Chapter 5 provides a practical guide for creating a virtual micro-museum using the spatial platform.

The Spatial platform is accessible through a web browser, it has a free usage plan, it offers an immersive experience with VR headset support, and it's versatile in handling various multimedia formats.

Chapter 6 focuses on the means and ways to have an immersive virtual museum.

A very inclusive digital museum should be explored at any level by any kind of people and disabilities. Accessibility is a feature of inclusion and it takes into account comfortable movement, readability and quick accessibility.

Finally, chapter 7 guides the user through the detailed process of testing,

systematic bug management, thorough verification of copyrights for all multimedia materials, and the preparation of a robust emergency plan.



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GLOSSARY

Accessibility: Measures ensuring usability for all visitors, including those with disabilities (e.g., alt-text, subtitles, text-to-speech).

Alt text: Alternative text, a short description of an image, providing context and meaning to images, making them more understandable.

Caption: A brief text description or explanation accompanying an image, video, or other media, providing context or additional information.

Digital Literacy: The ability to use digital tools and technologies to find, eval- uate, create, and communicate information effectively.

Guide: Companion document offering theoretical and pedagogical contex for the Toolkit.

Heritage: The cultural, historical, and natural assets and traditions inherited from the past, valued and preserved by communities.

Impairment: A condition that limits or hinders someone's physical, mental, or functional abilities.

Informative hotspot: An area or point of interest that provides additional information, often through digital means, such as QR codes, NFC tags, or interactive displays.

Legacy: A lasting impact or contribution, such as knowledge, culture, or re- sources, that continues to benefit future generations.

Outreach: Activities aimed at engaging, informing, or supporting communities and audiences beyond the organization's immediate members.

Peer Review: Evaluation of a draft by co-partners to ensure quality, consis- tency, and adherence to project standards.

Photogrammetry: The science of extracting information from photographs, typically to create 3D models or maps from 2D images.

Repository: A centralized digital or physical collection where data, resourc- es, or content are stored, organized, and preserved for long-term use.

- **Setup phase:** The initial stage of a process or project where preparations are made, configurations are set, and foundations are laid for the subsequent phases or activities.
- **Scrolling:** The action of moving content up, down, or sideways on a screen to view information that is not currently visible.
- **Spatial.io:** A platform for creating and sharing immersive VR experiences, used here as the main tool for virtual museum design.
- **Toolkit:** Practical document containing workflows, templates, and technical guidelines.
- **UNESCO categories:** International classification standards used to label and contextualize digital cultural heritage items.
- **Waypoint:** A specific point or location used as a reference or marker, often in navigation, travel, or mapping.
- **Workflow:** A series of tasks or activities that are necessary to complete a specific process or project, often involving multiple people, systems, or departments working together in a coordinated manner.
- **Zooming:** The action of enlarging or reducing the display of content on a screen to see details more clearly or fit more information in view.





CHAPTER 1

Ideas and audience



WHY IT MATTERS. DECIDING WHAT STORY WE TELL AND WHO WILL VISIT THE VIRTUAL MUSEUM

The Virtual Museum is a transformative tool for education because it makes learning more interactive, allowing users to move from being passive recipients to active explorers, navigating digital exhibitions and interacting with 3D objects, videos, sounds, and multimedia narratives.

- It democratizes access to culture by enabling students and teachers, regardless of geographic location or socioeconomic conditions, to enjoy high-quality heritage content.
- At the same time, it enhances active methodologies such as project-based learning, guided research, and peer collaboration, encouraging young people to contribute with their own stories and digital productions. It is also a space that integrates interdisciplinary knowledge, crossing History, Arts, Sciences, Technologies, and Civic Education, creating opportunities for more dynamic and meaningful lessons.
- Moreover, it values local identity and cultural diversity, allowing students to see themselves in the narratives of their territory while discovering other European cultural realities, promoting empathy and intercultural dialogue. By participating in content creation, young people develop digital and media literacy skills, learning to research, select, create, and communicate information critically.
- Finally, the Virtual Museum is accessible to different learning paces, as it is an open digital platform that allows revisiting content and adapting it to each young person's needs, including inclusive resources for all.

In short, the goal is for the MUSED Virtual Museum to be a living archive of cultural heritage and a digital learning lab, designed to motivate, engage, and inspire students, teachers, and communities. A tool that reinvents how we teach and learn about heritage, using digital technologies to bring the past closer to the present and future in an interactive, inclusive and collaborative way.



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TARGET AUDIENCE

- Students
- Educators
- Partner museums and cultural institutions
- Students' families
- General European public

EXAMPLES OF VISITOR PERSONAS

Persona 1: Student – Curious about local or European heritage. Learns through images and videos. Likes creating short videos and sharing on social media. Wants to feel their story matters.
Persona 2: Teacher – Interested in digital tools with pedagogical value. Wants to engage students in motivating, curriculum-linked projects.
Persona 3: Regional Museum Director or Educational Service Teacher – Wants to modernize school connections and increase the museum's digital presence. Seeks simple ways to contribute with historical content.
Persona 4: Parent – Wants to follow their child's school projects and better understand the value of local and European cultural heritage.
Persona 5: Community Center Technician – Participates in collecting intangible heritage elements like oral traditions and local cuisine. Helps give visibility to their community's cultural heritage.
Persona 6: Retired Storyteller – Shares local knowledge and memories (e.g., old professions), integrating intangible heritage. Supports youth in understanding the importance of oral traditions and cultural practices.

GOAL SHEET

Promote digital literacy

Teach students and teachers to use digital tools creatively and critically.
Develop skills in editing, curating, organizing information, and multimedia production.
Encourage safe, ethical, and responsible digital navigation.

Engage students in discovering and valuing heritage.

Encourage exploration of local and European heritage (material, immaterial, natural, artistic).
Transform students into curators of their own cultural stories.
Develop empathy, identity pride, and a sense of belonging to a shared heritage.

Promote collaborative learning

Create joint workspaces between students, teachers, and cultural institutions.
Stimulate exchange of stories and cultural practices across European countries.
Foster teamwork, respect for diversity, and sharing of perspectives.

Reflect on European Union values

Relate heritage to themes such as solidarity, inclusion, diversity, freedom, and peace.
Create content showing how these values manifest in local cultures.
Engage youth in meaningful European citizenship actions.

Increase visibility and access to culture

Make the museum accessible to anyone, anywhere, anytime.
Give voice to lesser-known or endangered communities and traditions.
Contribute to cultural democratization and pedagogical use of heritage.

Create a shared and sustainable repository

Leave a lasting digital educational legacy Enable schools, museums and communities to continue feeding the museum with new stories.
Establish a European network of memory and digital creativity.



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MINI-STORYBOARD

Here are the examples of user-scenarios and the content ideas that can be used for creating a successful virtual museum. The materials that follow provide a clear framework for developing digital spaces through storyboards, interactive journey tables, and detailed lists of required media resources.

Suggestion A (3 Key Screens)

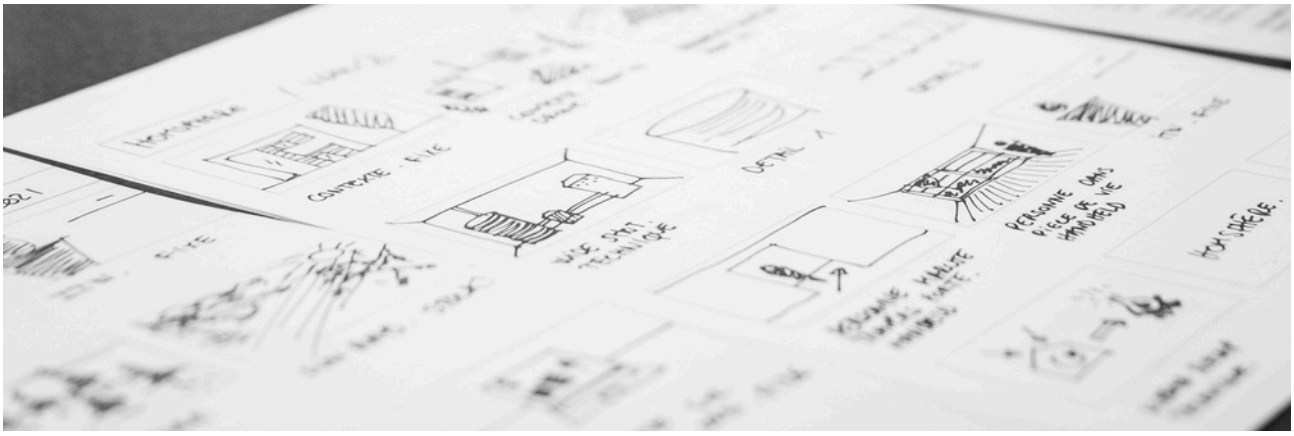
Screen 1: Interactive Map of Europe – Each partner country appears with a clickable icon. Selecting it shows digital stories created by students from that region.
Screen 2: Virtual Exhibition Room – Short videos, audios, and photos narrate the importance of material and immaterial heritage and its meaning to the community. The student-narrator relates the event to European values like solidarity and cultural diversity.
Screen 3: Digital Creative Lab – Area where visitors can create a poster, video, or text about their local heritage using simple, shareable templates. Teachers can download educational worksheets.

Suggestion B – Interactive Museum Journey Table

Room name	Pedagogical Goal	Content & Format	Interaction
Welcome to the Virtual Museum	Present the project and cultural heritage theme	Introductory video with subtitles, narrated by students	Start visit button
Our Oral Traditions	Value collective memory and storytellers	Audio + student illustrations	Button to hear other versions
Monuments That Tell Stories	Link physical heritage to local and European history	Photo gallery + interactive map	Click to learn more
Artistic Expressions in the Community	Reflect on art as cultural and identity language	Short videos of dances, music, paintings	“Discover similarities” option with other countries
European Values and Heritage	Relate EU values to cultural heritage	Text + interactive image with student quotes	Interactive quiz



Participate and Share – Museum Diary	Engage visitors, promote collaboration	Digital wall for comments, suggestions, sharing	Text box / “Send” button
Educational Space	Provide guidance and propose pedagogical approaches for educators	Guides for educators, worksheets, activity proposals based on the museum	—



Photography on Pixabay

List of Needs (Images, Audio, Video, Text)

Type	Description
Photos	Photographs of local monuments, traditional festivities, costumes, folk art, and cultural objects
Audio	Narrations by students, interviews with family members, storytellers or local experts, recordings of music or oral legends
Video	Short documentaries or creative films produced by students, enactments of rituals or traditions, recordings of artistic performances, tutorials on traditional dances, cooking, or music
Text	Exhibition captions, personal testimonies, historical descriptions, thematic glossaries, local biographies, and links to complementary resources. Educational guides and support materials for teachers
Other Resources	Templates for posters, educational worksheets, quizzes, interactive challenges, digital games, timelines, illustrated or interactive maps





CHAPTER 2

Preparing multimedia content. Step-by-step help to create high-quality 2D photos, 3D models, audio clips, video clips, and text labels, and store them safely.

TUTORIAL OVERVIEW

This chapter is a foundational guide for the MUSED project, which empowers students and educators to use digital tools for learning about European cultural heritage. The project aligns with the Erasmus+ Programme, which supports personal development through lifelong learning and promotes sustainable growth, quality jobs, and social cohesion. The toolkit is shaped by Erasmus+ priorities of inclusion, diversity, and equity, requiring content to be accessible and ethical. This means accessibility is a core design principle, not a secondary concern. The ultimate goal is to foster a sense of European identity and solidarity by making cultural heritage accessible to a diverse range of participants. The project targets students aged 14-18, teachers, cultural institutions, parents, families, and the general public, all of whom will benefit from the “Virtual Museum of European Heritages.”

Take clear photos

This section provides a guide for creating high-quality 2-D photographs of cultural heritage objects and sites, using ethical and technical best practices. The methodology is in line with the work of organizations like Cultural Heritage Imaging (CHI).

Foundational Principles: Composition, Lighting, and Visual Storytelling

Mastering composition is the first step in creating visually compelling photographs.
A key principle is the “Rule of Thirds,” which involves dividing the frame into nine equal parts and positioning key elements along the intersecting lines for balance and movement. A balanced approach of “detail vs. context shots” is a critical component of ethical storytelling, countering the colonial tradition of decontextualized anthropological photography. By including environmental context, the toolkit promotes a more respectful and holistic approach to cultural documentation. Deliberate control of light is equally important. The “exposure triangle” (aperture, shutter speed, and ISO) allows a photographer to capture the authentic mood of a scene. For low- light conditions, use a higher ISO (800-3200), a wide aperture (f/1.8 to f/2.8), and a shutter speed of at least 1/100th of a second to avoid motion blur. For bright daylight, a lower ISO (100-400), a faster shutter speed (1/500th or more), and a middle-range aperture (f/5.6 to f/8) are preferred.

Finally, understanding that a photograph is a narrative tool is crucial. A common approach is to begin with context shots to establish the scene, then move closer to capture specific details, while maintaining a clear connection to the environment.

Essential Camera Settings and Equipment

Accurate color reproduction is important when documenting cultural heritage.
A recommended technique is to use a gray card or white balance target before shooting to establish a neutral reference point. For flexibility in post-processing, it is advised to shoot in RAW format, which preserves more color information and allows for precise adjustments without degrading image quality.



Photography on Freepic

Obtaining proper permission and consent is a fundamental pillar of ethical documentation. The process begins by identifying appropriate community leaders or cultural practitioners who can grant permission. It is essential to be clear about how the images will be used and to honor any requests to delete specific images or to share copies of the photographs. When photographing, maintain a respectful distance and use quiet camera settings to avoid interfering with the proceedings.

All meaningful images in a digital document require alt text (alternative text), which is read by screen readers to describe an image for those who cannot see it. Unlike a caption, which provides contextual information, alt text describes the image itself. Images that are purely decorative do not require alt text. Best practices include keeping alt text concise but descriptive, avoiding phrases like “image of,” and tailoring the description to the context and audience. For complex images, a short alt text within the document can refer to a longer, more detailed description in an appendix.



Photography on Freepic

MAKE 3D MODELS

This section demystifies the process of creating 3-D digital models, with a focus on photogrammetry as an accessible method for cultural heritage documentation. This is an innovative approach to capturing and preserving vulnerable heritage.

An Introduction to Digital 3-D Documentation: Photogrammetry vs. 3D Scanning

There are two primary methods for creating digital 3-D models: photogrammetry and 3D scanning. Photogrammetry is an image-based technique that processes multiple overlapping photographs to generate a 3-D model. Its advantages include lower cost, greater portability, and the ability to reproduce an object in full color and texture. 3D scanning uses active light sources, such as lasers, to create a high-precision digital model. While it offers superior metrological accuracy and is ideal for capturing surfaces with little texture, it is generally more expensive, less portable, and requires controlled lighting. The accessibility of photogrammetry makes it an ideal, inclusion-focused method for a toolkit aimed at students and educators, directly aligning with the Erasmus+ mission.

Feature	Photogrammetry	3D Scanning (Laser/Structured Light)
Equipment Needed	Digital Camera, Computer, Software	Dedicated 3D Scanner, Computer, Software
Cost	Relatively low; often uses existing equipment and free software	High; can be prohibitively expensive for small projects
Portability	High; only requires a camera and computer	Varies; some handheld scanners are portable, but others are large and complex
Ideal Use Case	Capturing objects and scenes with rich color and texture. Best for inaccessible locations or when high-speed recording is needed.	High-precision geometry and measurements. Best for objects with little texture, reflective surfaces, or documenting decay.
Accuracy	Good for visual realism and texture	Excellent for metrological accuracy and capturing subtle details.

The Photogrammetry Workflow: A Step-by-Step Guide

The process involves several distinct steps:

Step 1:

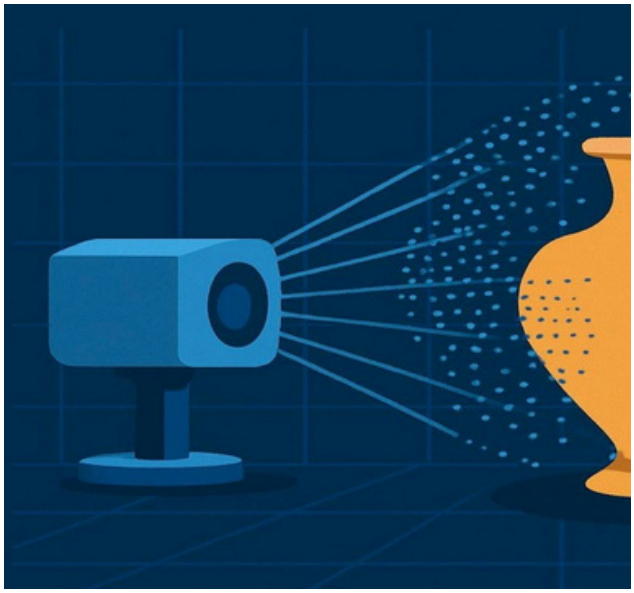
Data Collection. This requires capturing multiple overlapping images of an object or site from various angles, with a significant overlap of 60-80%. The object must be static, and it is best to avoid reflective surfaces and uneven lighting.

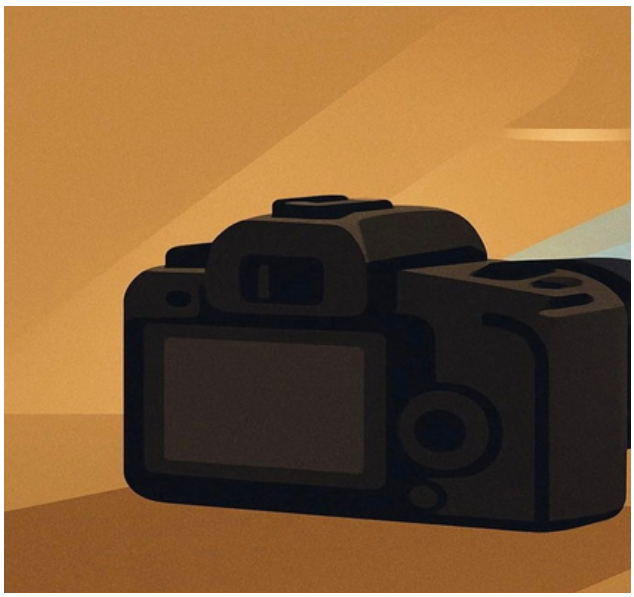
Step 2:

Processing. The images are imported into specialized software, which aligns them and generates a dense point cloud, a collection of data points representing the object's surface. This is then used to create a mesh before textures are applied.

Step 3:

Post-Processing. The generated model often requires cleanup, such as using software to cut off messy parts or delete unnecessary background elements.





Essential Equipment and Software for Photogrammetry

Photogrammetry can be performed with a standard digital camera or even a good mobile phone. Free and open-source software like Meshroom, 3DF Zephyr Free, and Visual SFM democratizes this task, allowing non-professional users to participate in high-level archival work without significant financial barriers.



RECORD AUDIO

This section provides guidance on capturing high-quality audio, differentiating between structured interviews and ambient field recordings. A dedicated digital sound recorder is the best option for long interviews at high quality, as mobile phones and laptops are not designed specifically for this purpose.

Recording Oral Histories: Pre-Production and Interview Technique

Preparation is key; a skilled interviewer should research the interviewee and prepare a list of simple, open-ended questions. A quiet location is ideal, and all non-essential electronics, such as phones and fans, should be turned off. A brief test recording should always be conducted before the interview begins. During the interview, the microphone should be positioned as close to the speaker as possible to capture clear sound and reduce background noise.



Capturing Ambient Sound: Planning and On-Location Best Practices

Ambient audio, or room tone, is the natural background sound of a space that adds realism and emotional depth to a video.
You should intentionally record a dedicated “room tone” by asking everyone to remain silent for 30 to 60 seconds after a scene has been filmed. This clean audio can be used to smooth out edits and patch audio inconsistencies. Recording from multiple positions provides more flexibility during editing.

Recommended Equipment and Technical Specifications

For high-quality recordings, a dedicated digital sound recorder is recommended. Popular models include the Zoom H4n, H5, and Tascam DR series. Headphones are an essential accessory for monitoring audio levels in real time. It is strongly recommended to record in an uncompressed format like WAV or LPCM, as compressed formats like MP3 suffer a noticeable loss of quality when edited. A critical technical consideration is to ensure that the audio meters on the recording device always peak below 0 dB to avoid “clipping.”
A target peak level of -20 dB or -12 dB is generally recommended.

Equipment Type	Recommended Models	Pros	Cons	Ideal Use Case
Handheld Recorder	Zoom H4n, H5; Tascam DR-40X	Portable, built-in stereo mics, long battery life, accepts external mics.	Can be entry-level with limited functionality.	Oral histories, ambient soundscapes, field recording.
External Mic	Lavalier (tie-clip), Handheld, Shotgun, Omni-directional	Superior sound quality, flexibility in placement.	More expensive.	Oral histories (lavalier), ambient sound (omni-directional), targeted audio (shotgun).
Headphones	Over-ear headphones	Essential for monitoring audio levels, catching unwanted noises, and ensuring sound quality.	None.	All recording scenarios.

SHOOT SHORT VIDEOS

This section covers the entire video production pipeline, with a strong focus on ethical and accessibility standards.

Pre-Production: Storytelling, Scripting, and Storyboarding

Before filming begins, it is essential to define the video's purpose and target audience. While documentaries are not typically scripted, creating a broad outline or storyboard is highly recommended to visualise the footage needed and plan camera angles. Effective stories often centre on "Object Stories," which convey the significance of an artefact, or "Video Experiences," which immerse visitors in a dynamic storytelling space.

Filming Techniques and Equipment for Cultural Documentation

Practical preparation is paramount for on-location filming. It is advisable to carry spare batteries and memory cards. To ensure steady footage, a tripod is highly recommended. To maintain a respectful distance, use quiet camera settings to avoid interfering with proceedings. For the highest quality and flexibility in post-production, it is advised to shoot in RAW format.

Ethical and Respectful Video Production

Documentary filmmaking is built on trust. It is crucial to build and maintain ongoing relationships with subjects, as this allows for the capture of authentic moments. It is also essential to maintain authenticity by documenting, rather than directing, the proceedings. This collaborative, community-driven documentation counters historical power imbalances where outside photographers reinforced Western narratives.

Ensuring Accessibility: Captions, Transcripts, and Audio Description

For all videos created for the MUSED project, providing captions is a mandatory requirement to meet accessibility standards. Captions are text versions of the audio content, synchronized with the video, and are essential for viewers who are deaf or hard of hearing. In addition to captions, it is highly recommended to provide a full transcript of the video content, as it allows users to quickly scan for information or access the content when they are unable to watch the video. Finally, for videos that contain important visual information not conveyed through the audio, a separate narrative audio description track should be created to make the content accessible to individuals with visual impairments.

CLEAN AND COMPRESSED AUDIO

This section provides an overview of file compression, detailing why it is necessary and how to choose the right formats and tools.



The Importance of File Compression

Data compression is the process of encoding or restructuring data to reduce its size. This is a critical step because it reduces storage space, decreases file transfer time, and consumes less bandwidth, which can lead to significant cost savings.

Understanding Compression Methods: Lossless vs. Lossy

Compression is typically categorized into two main forms: **lossless and lossy.**

- **Lossless Compression:** This method removes statistical redundancies without deleting any information. The file can be fully decompressed to its original state, making it ideal for professional media files and archives where maintaining absolute quality is critical. Examples include PNG for images and FLAC for audio.

- **Lossy Compression:** This method achieves a higher compression ratio by deleting information deemed "unnecessary" or imperceptible to the human eye or ear. It is commonly used for files shared online, such as JPEGs, MP3s, and MPEGs.

This difference highlights a need for a two-tiered strategy: creating a high-quality, uncompressed archival master and a compressed, lossy version for web and social media sharing.

Recommended File Formats and Compression Tools for Multimedia

For audio, an uncompressed WAV file is ideal for archival purposes, while the MP3 format is suitable for web distribution. For video, modern codecs like H.264 and H.265 are recommended for their excellent quality at a reduced file size. Free online tools like VideoProc Converter AI and FreeConvert can be used to compress multimedia files.

Media Type	Common Formats	Compression Type	Recommended use case	
Image	JPEG, PNG	Lossy (JPEG), Lossless (PNG)	JPEG: Web, social media, general use (smaller file size).	PNG: Graphics with transparency, professional editing (maintains original data).
Audio	WAV, MP3, FLAC	Lossless (WAV, FLAC), Lossy (MP3)	WAV: Archival, editing master file	MP3: Web, sharing, streaming (smaller file size).
Video	MP4 (H.264, H.265), MOV	Primarily Lossy	H.264: Standard for web and social media.	H.265: Higher efficiency, best for high-resolution video.

GIVE CLEAR FILE NAMES AND UPLOAD TO DRIVE

This final section provides a framework for file management, ensuring all assets are discoverable, organized, and shared responsibly. A consistent file naming convention is a fundamental principle of professional digital archiving.



Establishing Consistent File Naming Conventions

Clear and consistent file naming is essential for long-term storage, retrieval, and collaboration. A standardised naming convention is a fundamental principle of professional digital archiving. Recommended rules include avoiding spaces and special characters, using lowercase letters and hyphens, and using the ISO 8601 date format (YYYYMMDD) for chronological sorting.

Component	Rationale	Example
All images have descriptive alt-text	Ensures files are tied to the project.	MUSED
Videos include subtitles or captions	Provides chronological organization.	20250720
Audio materials have transcripts	Indicates the media format.	Photo, 3DModel, Audio, Video
Colour contrast meets WCAG standards	Links the file to a specific artifact or subject.	012, maria_montessori
Navigation is possible via keyboard	Differentiates edited versions.	_cropped, _original, _bw
File Extension	Identifies the file format.	.jpeg, .wav, .mp4

The Role of Digital Asset Management (DAM) in Collaboration

A Digital Asset Management (DAM) system acts as a “single source of truth” for the full content lifecycle, providing features like version control and a central repository for assets. By adopting a structured file naming convention, collaborators can emulate the functionality of a DAM system to ensure a smooth, efficient workflow.

Understanding Open Access and Creative Commons Licensing

The MUSED project's mission of sharing and collaborative creation requires a clear and responsible licensing strategy. The principle of open access dictates that content should be available and easy to find online, free of charge, and liberally licensed to allow anyone to use and redistribute it. Creative Commons (CC) licenses provide a legal framework that simplifies the communication of reuse conditions. The most relevant open licenses are CC BY (Attribution) and CC BY-SA (Attribution-ShareAlike), which allow for unrestricted use as long as the original creator is credited. The CC BY-SA license includes a "ShareAlike" clause, which requires anyone who adapts the work to share their modified version under the same license. This ensures all new content built on the project's foundation remains open and accessible.



'Pointcloud'oftheThreeGracesbyAntonioCanova © Factum Foundation

CONCLUSIONS

The analysis in this report highlights that effective cultural documentation requires a comprehensive approach that merges technical skill with a deep commitment to ethical responsibility and accessibility. The MUSED project toolkit, by providing step-by-step guidance, will not only equip students and educators with practical skills but will also empower them to become responsible stewards of cultural heritage. The project's alignment with the Erasmus+ Programme's focus on inclusion and diversity means that these methodologies are foundational requirements. The availability of accessible technologies, such as photogrammetry and free open-source software, democratises the process of cultural documentation, allowing a broader community to engage in profesional-level work without significant financial barriers. By addressing the ethical dimensions of representation and consent, the toolkit actively promotes a modern, respectful, and collaborative approach that counters historical power imbalances. Ultimately, this toolkit empowers its participants to become a vital part of a global movement dedicated to preserving and sharing Europe's rich cultural heritage in an inclusive, transparent, and enduring manner.



CHAPTER 3

Labels and Unesco Categories



WHAT THE UNESCO CATEGORIES ARE

Cultural and natural heritage constitute invaluable and irreplaceable assets, not only for individual nations but for humanity in its entirety. The degradation or disappearance of any element of this heritage represents a profound loss, resulting in the impoverishment of the collective legacy of all peoples. Certain components of this heritage, by virtue of their exceptional characteristics, are recognized as possessing Outstanding Universal Value and, as such, warrant special measures of protection against the growing array of threats they face. To this end, specific criteria and conditions have been established for the inscription of properties on the World Heritage List, serving as a framework for assessing their Outstanding Universal Value and guiding States Parties in their protection and management. The UNESCO World Heritage Convention constitutes a fundamental international instrument for the safeguarding of cultural and natural heritage of global significance. Its principal objective is the identification, protection, conservation, and presentation of heritage sites deemed to be of Outstanding Universal Value. Adopted by the General Conference of UNESCO in 1972 and ratified by 195 Member States to date, the Convention sets forth the definitions of cultural and natural heritage, as well as the obligations incumbent upon Member States and the international community in ensuring the effective protection of these shared patrimonial assets.It provides a framework for international cooperation in preserving and protecting cultural treasures and natural areas throughout the world.

There are three types of sites:



- CULTURAL
- NATURAL
- MIXED

NATURAL HERITAGE

Natural heritage sites are restricted to those natural areas that:

1 – furnish outstanding examples of Earth's record of life or its geologic processes,
2 – provide excellent examples of ongoing ecological and biological evolutionary processes,
3 – contain natural phenomena that are rare, unique, superlative, or of outstanding beauty,
4 – furnish habitats for rare or endangered animals or plants or are sites of exceptional biodiversity.



Mount Etna. Photography on Pixabay

The following shall be considered as "natural heritage" from the aesthetic or scientific point of view:

- natural features consisting of physical and biological formations or groups of such formations;
- geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of Outstanding Universal Value from the point of view of science or conservation;
- natural sites or precisely delineated natural areas.

MIXED CULTURAL AND NATURAL HERITAGE

Mixed heritage sites contain elements of both natural and cultural significance. Properties shall be considered as "mixed cultural and natural heritage" if they satisfy a part or whole of the definitions of both cultural and natural heritage. Mixed cultural and natural heritage refers to locations where both cultural and natural elements are significant and interconnected. These sites demonstrate the close relationship between human societies and their environment, often featuring landscapes shaped by human activity or natural features imbued with cultural meaning. Examples include areas with both archaeological remains and unique ecosystems, or places where traditional practices are deeply intertwined with the natural world. Cultural landscapes inscribed on the World Heritage List are cultural properties and represent the "combined works of nature and of man". They are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic, and cultural forces, both external and internal. They should be selected on the basis both of their Outstanding Universal Value and of their representativity in terms of a clearly defined geo-cultural region. They should be selected also for their capacity to illustrate the essential and distinct cultural elements of such regions.

The term “cultural landscape” embraces a diversity of manifestations of the interaction between humankind and the natural environment. Cultural landscapes often reflect specific techniques of sustainable land use, considering the characteristics and limits of the natural environment they are established in, and may reflect a specific spiritual relationship to nature. The continued existence of traditional forms of land use supports biological diversity in many regions of the world. The protection of traditional cultural landscapes is therefore helpful in maintaining biological diversity.

INTANGIBLE CULTURAL HERITAGE

The concept of cultural heritage has undergone a significant evolution in recent decades, influenced in part by the normative frameworks established by UNESCO. Cultural heritage is no longer understood solely as encompassing monuments and collections of tangible objects. It also embraces living traditions and expressions inherited from previous generations and transmitted to future ones. These include, but are not limited to, oral traditions, performing arts, social customs, rituals, festive events, traditional ecological knowledge, cosmological practices, and the artisanal skills associated with traditional craftsmanship. Despite its inherent fragility, intangible cultural heritage plays a vital role in safeguarding cultural diversity, particularly in an era marked by rapid globalization.
A deeper appreciation of the intangible heritage of diverse communities fosters intercultural dialogue and promotes mutual respect for differing worldviews and ways of life. The significance of intangible cultural heritage lies not merely in the cultural expressions themselves, but in the extensive body of knowledge and expertise they convey across generations. This transmission holds substantial social and economic value for both minority and majority populations within a State. Moreover, its relevance transcends levels of development, being equally critical to the cultural vitality of developing and developed countries alike.



The Busó festivities at Mohács, Hungary
Photo by Anchumol Chacko from Pexels.com



Straw weaving art in Belarus
Photography on Freepic.com

Intangible cultural heritage is characterized by several key features:

Simultaneously traditional, contemporary, and living: It encompasses not only inherited traditions from the past but also current practices—both rural and urban—that continue to evolve. These expressions are actively maintained and adapted by diverse cultural communities around the world.

Inclusive in nature: Intangible cultural heritage includes expressions and practices that may be shared across different communities. Regardless of their origin, these elements are considered intangible heritage if they have been transmitted across generations, have adapted to changing contexts, and foster a sense of identity and continuity.

Representative: Its value lies not in rarity or uniqueness, but in its rootedness in community life. It depends on the knowledge, practices, and skills maintained and transmitted by community members, who ensure its continued relevance through intergenerational transmission and exchange with other communities.

Community-based: An element can only be considered intangible cultural heritage if it is recognized as such by the communities, groups, or individuals who practice and sustain it. This recognition is essential; external authorities cannot unilaterally determine what constitutes a community's heritage without their acknowledgement and consent.

THE MEMORY OF THE WORLD

The world's documentary heritage is a shared legacy that belongs to all humankind, transcending borders, cultures, and institutions. As such, it must be fully preserved and protected to ensure its survival for present and future generations. This responsibility requires global cooperation to safeguard historical documents, archives, and records from threats such as deterioration, conflict, neglect, and technological obsolescence. At the same time, universal access to this heritage must be promoted, with the understanding that cultural traditions, privacy considerations, and practical constraints must be respected. While recognizing these cultural mores and realities, efforts should aim to make documentary heritage permanently accessible to all people, without discrimination or undue hindrance. Initiatives like UNESCO's Memory of the World Programme and global digitization projects reflect this commitment, working to ensure that knowledge and memory are preserved and shared as a common good for the benefit of all.

The Memory of the World Programme aims to:

- Facilitate preservation of the world's documentary heritage, particularly in areas affected by conflict and/or natural disaster
- Enable universal access to documentary heritage worldwide
- Enhance public awareness about the significance of documentary heritage among the wider public



Situation plans of towns and villages of Jewish settlement n the Habsburg Empire. ©National Archives of the Czech Republic



The Treaty of Perpetual Peace of Friborg (1516) ©Archives Nationales de France

BASIC DATA TO WRITE

The basic information included in the museum labels that will accompany the digital museum exhibits are the following:



Model label that will accompany the digital museum exhibits

- Origin/Location
- Description
- Mediums/ Techniques
- Creation date
- Creator/Author of the label
- Year of inscription on UNESCO Heritage List
- Important information



CHAPTER 4

Designing the Virtual Gallery

VISITOR FLOW



Visitor flow in a digital museum encompasses more than just navigational ease; it involves creating a dynamic and rewarding experience that encourages exploration and engagement. Implementing reward mechanisms can significantly enhance this aspect. For instance, gamified elements such as badges, progress trackers, or unlockable content can motivate visitors to delve deeper into exhibits, fostering a sense of accomplishment and continuous learning (Li, Zhang, & Liu, 2025).

These reward mechanisms not only incentivize engagement but also encourage repeated visits, promoting long-term educational outcomes.

Designing visitor flow requires careful consideration of all potential users, including those with visual, cognitive, and mental disabilities. Inclusivity entails creating pathways that are understandable, adaptable, and customizable. For example, screen reader compatibility, keyboard navigation, and logical site hierarchy are essential features. Digital signage or visual cues should be supplemented with alternative text and clear descriptions to support visually impaired users (Henry, 2019). Interactive tasks tailored for students can transform passive viewing into active learning. *Quizzes, puzzles, and small challenges* embedded in the exhibition foster critical thinking, engagement, and retention of knowledge (Li et al., 2025). By incorporating such interactive elements, the museum becomes a space where learning is both playful and meaningful. For example, a virtual scavenger hunt can guide students through different galleries, rewarding exploration and observation.

A well-designed visitor flow also anticipates cognitive load.

Minimizing unnecessary clicks, avoiding cluttered layouts, and providing clear instructions for interactive elements help users with attention difficulties or learning disabilities navigate the exhibition with confidence. This approach aligns with the principles of Universal Design for Learning (UDL), which advocates for providing multiple means of engagement, representation, and expression to accommodate all learners (CAST, 2018).

By prioritizing inclusivity and interactivity, museums ensure that all visitors, regardless of ability, experience a meaningful and engaging online visit.



LIGHTS AND VIEWPOINTS

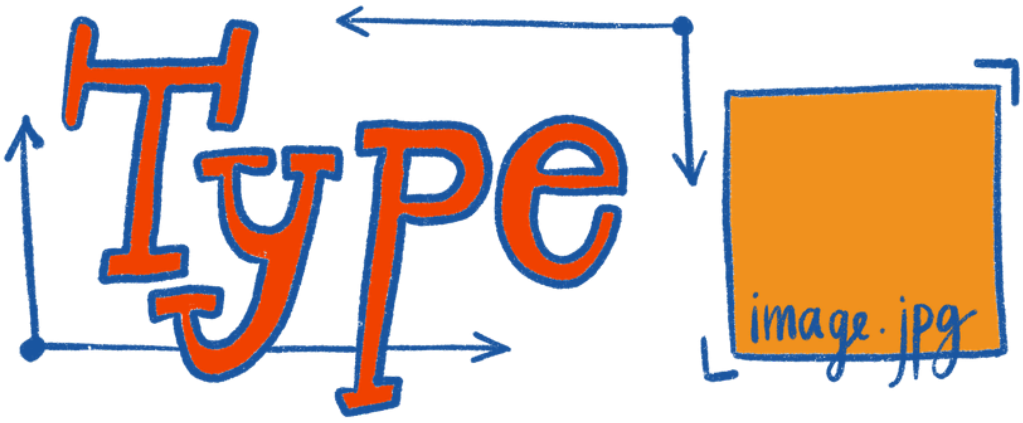
Visual representation in a virtual gallery is crucial for creating an immersive and accessible experience. Adjustable lighting and viewpoints allow users to tailor the environment to their preferences and needs. For instance, high-contrast modes or adjustable brightness levels support users with visual impairments, while zoomable interfaces allow for detailed examination of exhibits (Proctor, 2011).

Interactivity in visual presentation, such as 3D models, virtual tours, and rotatable objects, allows visitors to explore exhibits from multiple perspectives, enriching understanding and engagement (Champion, 2015). Haptic feedback and auditory descriptions can further enhance accessibility for visitors with sensory impairments.



For example, a virtual sculpture could provide tactile simulations or audio cues describing texture and shape. The aesthetic design of the virtual space plays a significant role in visitor engagement. Thoughtful placement of exhibits, coherent color schemes, and intuitive layouts guide users through the gallery, creating a cohesive and enjoyable experience. Principles from environmental psychology, such as way finding cues and spatial orientation, can improve navigability and reduce cognitive overload (Parry, 2013). Virtual lighting can also be adjusted dynamically to simulate natural environments, create mood, or highlight specific exhibits, adding depth to the visitor experience.

In addition, adjustable viewpoints combined with interactive overlays and contextual information provide multiple ways to engage with artifacts. For instance, a historical painting could include a guided viewpoint highlighting key symbols, with clickable annotations that offer more detailed descriptions. By offering both choice and guidance, digital museums accommodate diverse visitor needs and encourage exploration without causing disorientation.



CAPTIONS AND ALT TEXT

Easy-to-understand communication is defined as presenting information in a clear, simplified form, using linguistic and non-linguistic cues to convey meaning effectively (Farkasné Gönczi, 2021/a). The level of simplicity can be adapted to the visitor's comprehension abilities, ensuring inclusivity across a broad spectrum of users.

Alt text should not only describe visual characteristics but also contextualize historical or cultural significance in concise language. Captions for videos or interactive elements should similarly be short, descriptive, and easy to follow (Farkasné Gönczi, 2021/b).

One innovative approach is using AI-powered text generators to create diverse artifact descriptions. AI tools can generate content in multiple styles — from academic to narrative storytelling — allowing the museum to cater to different audiences (WriteCream, 2023).

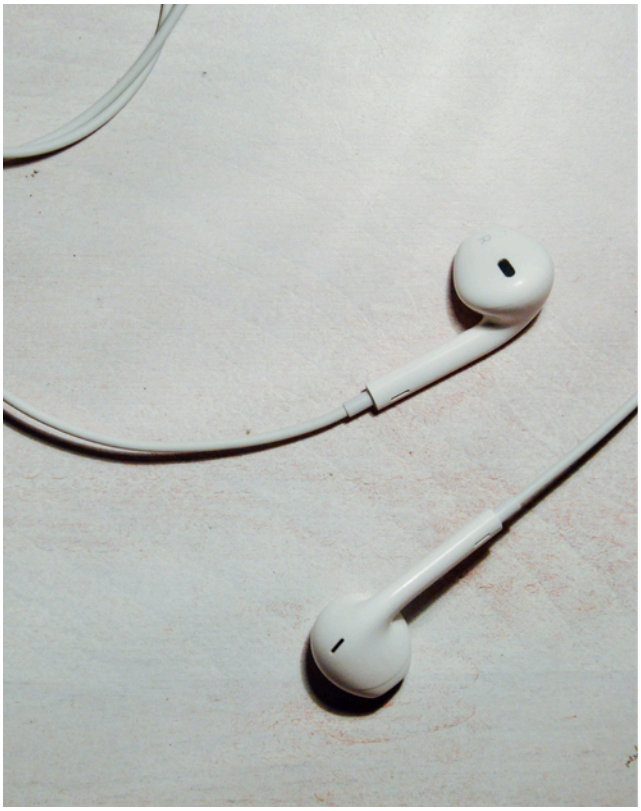
For example, a medieval artifact description could be presented as a short story for younger visitors or in scholarly language for researchers. AI can also support multilingual translations, broadening the museum's global reach while ensuring cultural accuracy and inclusivity.

Incorporating KÉK principles alongside AI-generated text ensures that the virtual gallery is not only accessible but engaging, offering visitors multiple ways to comprehend and interact with exhibits.

This integration transforms captions from a static textual feature into an adaptive, interactive tool that enhances learning and enjoyment.

RHYTHM, PAUSES, SOUNDS, AND EMBEDDED VIDEOS

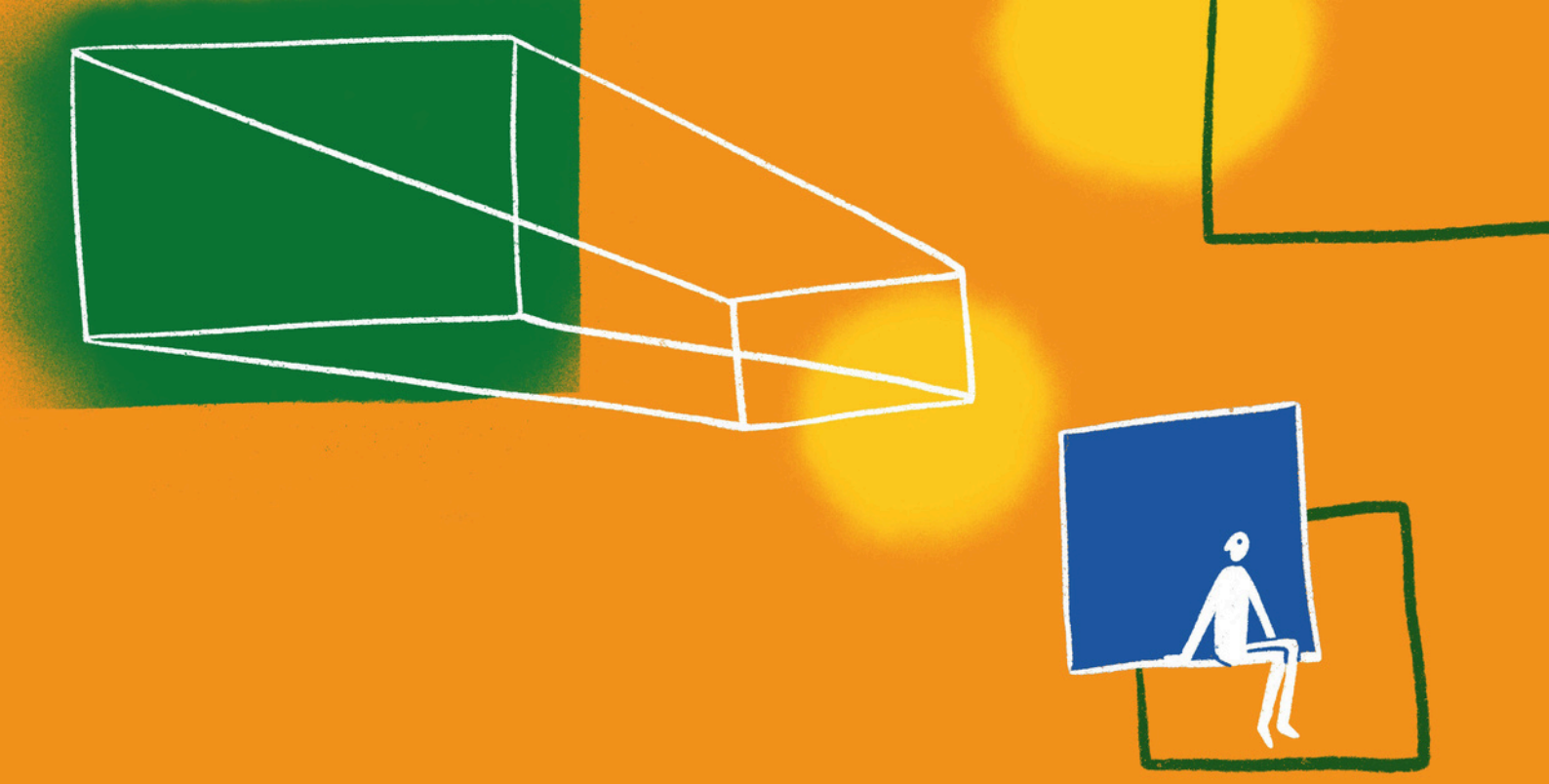
Adjustable sound settings, including volume controls, mute options, and the ability to replay or slow audio, accommodate visitors with hearing impairments or sensory sensitivities. Trigger warnings for sudden or loud sounds prevent overstimulation, particularly for individuals on the autism spectrum (Henry, 2019). Embedding multimedia —such as videos, audio guides, or interactive simulations—requires careful consideration of rhythm and pacing. Pauses between sections, clearly indicated progress markers, and playback controls allow visitors to control the flow of information, fostering comprehension and personalized engagement (Parry, 2013). Text enlargement and caption synchronization enhance accessibility further, allowing visitors to interact with content at their preferred pace. Interactive features within videos and embedded media can also support learning. For example, a video on ancient pottery could include clickable hotspots to explore manufacturing techniques, quizzes to test understanding, or short tasks to practice observation skills. Adjustable timing, audio description, and visual cues ensure that these interactive elements are accessible to all visitors. By integrating adjustable auditory, visual, and interactive features, the virtual gallery provides multiple pathways for engagement and understanding. This approach aligns with inclusive design principles, ensuring a welcoming and equitable digital learning environment for diverse audiences, from students to researchers to visitors with special needs (Farkasné Gönczi, 2021/b).



Photography on Pixabay

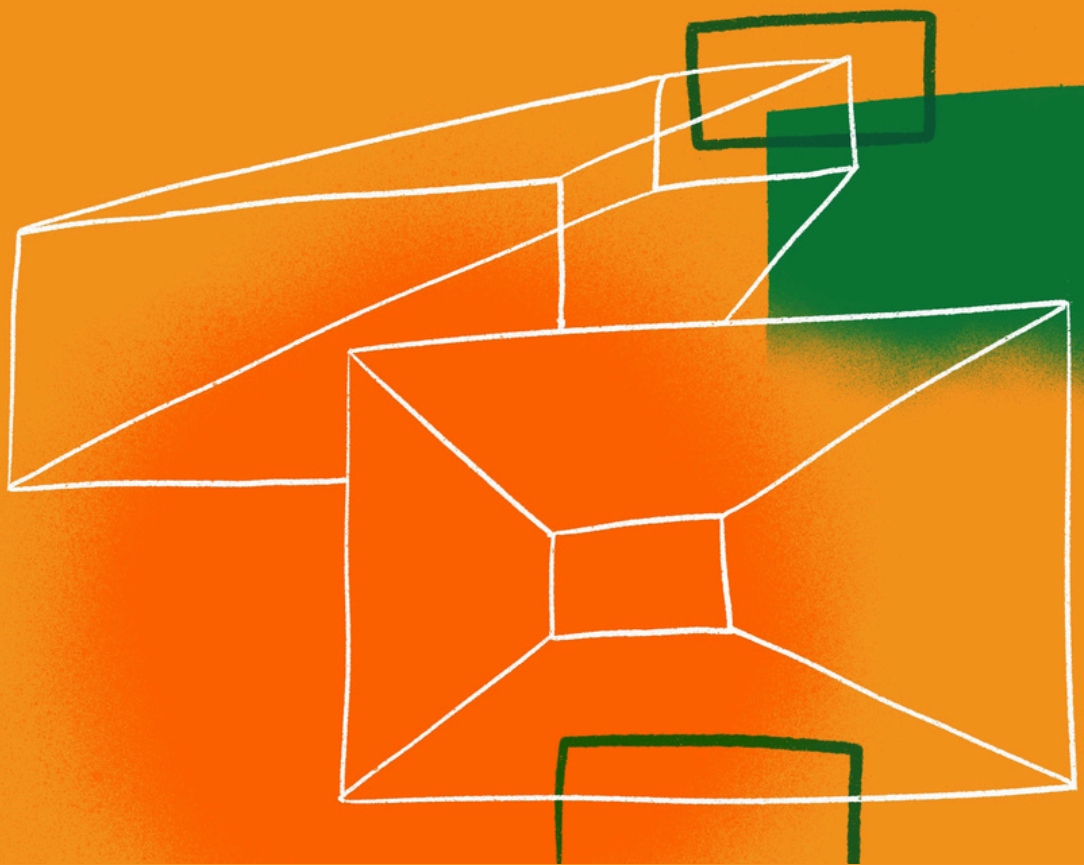


Photo on Pixabay



CHAPTER 5

Hands-on example with Spatial





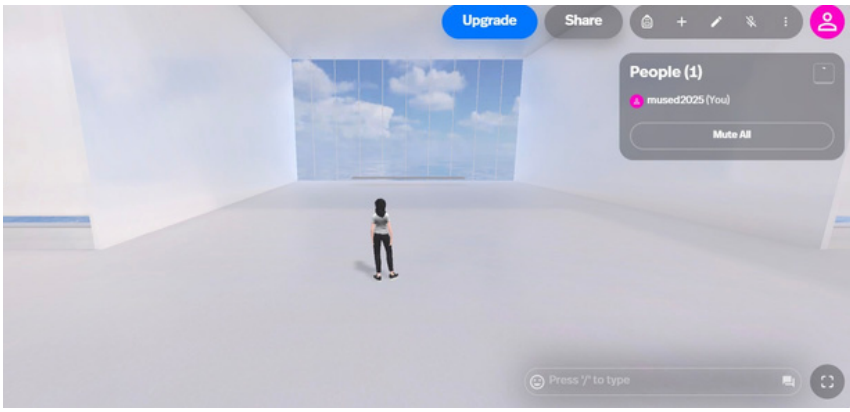
This chapter guides the reader through the creation of a virtual micro-museum in Spatial starting from an empty room. The goal is to carry out the technical steps and to understand the curatorial and accessibility logics that make a digital exhibition effective.

The selection of this platform is motivated by four key factors:

- **Accessibility:** It works directly through a web browser, without the need to install specific software on users' computers.
- **Cost:** It offers a free usage plan with features that are more than sufficient for the implementation of high-quality educational projects.
- **Immersiveness:** It fully supports fruition through Virtual Reality (VR) headsets, offering a higher-level immersive experience.
- **Versatility:** It allows importing and managing a wide range of multimedia formats, including three-dimensional models.

At the end, the user will know how to: open an account and create an empty room, upload 3D models, images, audio with transcript and video with subtitles, add interactive triggers to guide the visitor along a coherent path, and finally publish and share the space while read- ing the basic statistics to iterate on the content. A recent PC/Mac and a good connection are required; a VR headset is optional. This chapter is structured as an operational guide. By following the instructions provided, any user, even without prior technical skills, will be able to configure a digital environment, upload content to it, and make it accessible to a defined audience. To practice, it is useful to have a small set of assets: a lightweight .glb model, three high-resolution images, a short audio with transcript, and a video with subtitles. A metada- ta.xlsx file helps maintain consistency among titles, credits and UNESCO tags. The naming convention (MUSED_<Collection>_<Object>_<Type>_vYYYYMMDD) prevents confusion among versions and facilitates the reuse of materials.

OPEN ACCOUNT AND CREATE AN EMPTY ROOM



The first stage of the process consists of configuring the user account and generating the three-dimensional workspace.

1 Access to the Platform: Launch a web browser (e.g., Google Chrome, Mozilla Firefox) and go to **https://www.spatial.io.**

2 Start of Registration: Locate and select the “Sign Up” or “Login” button, usually placed at the upper right corner of the homepage. The platform offers several registration modes: via an email address and a password, or by linking an existing account (Google, Microsoft, Apple). It is recommended to use an institutional email address to ensure orderly project management and facilitate future collaborations.

3 Account Verification: If you choose to register via email, the system will send a verification message to the address provided. You must open this message and click the confirmation link to activate the account. This step is mandatory for security.

4 Creating a New Space: Once logged in, you will be redirected to the “dashboard,” the main control panel. From here, locate and select the “+ Create a Space” button. The system will present a series of templates (pre-configured models). A template is a starting 3D environment already furnished. For the purpose of a museum, it is advisable to select an option such as “Gallery” or “White Room.”

5 Initial Configuration and Access: Assign a descriptive name to the space (e.g., “MUSED – Cultural Heritage Exhibition”) and confirm creation. Uploading a 1920×1080 cover image will make the space recognizable in preview. A short description explains purpose and curation, while standardized tags and taxonomies (including UNESCO references where relevant) make content searchable. At the beginning it is prudent to keep the space Private or Unlisted, so the experience can be tested before publication. A small logo in the welcome panel strengthens visual identity, provided that minimum contrast for readability is respected.

6 After a brief loading, the user will be projected inside the empty 3D space, ready for the setup phase. Before making a final choice, it is advisable to enter different templates to explore their size, wall arrangement and type of lighting. A large environment is suitable for an exhibition with many objects, while a smaller space can highlight a few significant works.The template choice can also be changed later.

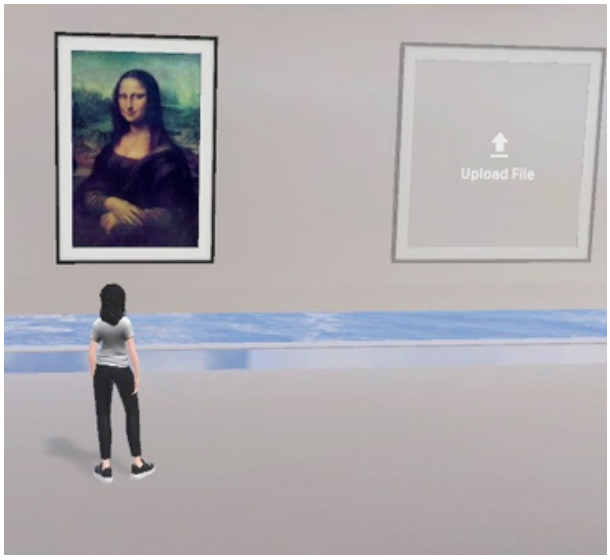
UPLOAD OBJECTS AND MEDIA

With the virtual space ready, the next step is the import of digital content (“assets”), prepared according to the indications of Chapter 2 of the Toolkit. To add content, use the “+” button (usually labeled “Add Content”) in the interface. This will open a dialog window to select files from your computer.

Images (JPG, PNG formats): Once uploaded, these files are displayed as framed pictures. By selecting them with the mouse, transformation handles appear that allow moving, resizing and rotating for precise positioning on walls.

3D Models (GLB, GLTF formats): These are standard file formats for three-dimensional ob- jects, optimized for web performance. An imported 3D model appears as a solid object in the space. It can be positioned freely, for example on pedestals already present in the template or imported separately as additional 3D models.

Video (MP4 format) and Audio (MP3 format): Video files are automatically inserted on virtual screens, whose dimensions can be modified. Audio files, on the other hand, have no direct visual representation but are associated with objects to be played through interaction.



Respecting the size limits

(3D ≤ 20 MB; video ≤ 100 MB; images ≥ 1200 px) ensures fast loading and stability.

If the scene is heavy, polygons and textures should be optimized or video duration reduced; small adjustments often significantly improve fluidity.

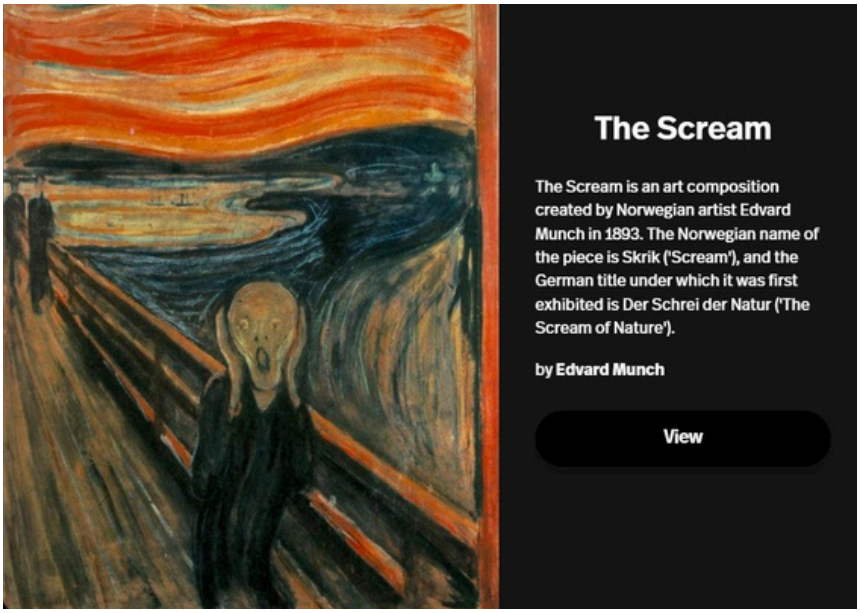


ADD TRIGGERS AND INTERACTIONS

This stage is crucial for transforming the space from a static showcase into a dynamic experience. Interactivity is based on a “cause-effect” logic: a trigger is the action performed by the visitor, while the action is the resulting event.

- **Informative hotspots:** These are clickable points that open cards or media. Placing them near the object they refer to helps visual association. Short texts (90–120 words) and simple language increase comprehensibility for diverse audiences.
- **Multimedia triggers:** Associating the opening of an audio file or a detail image with a hotspot allows differentiating the depth of information: those who wish to explore further can find additional materials without weighing down the basic path.
- **Waypoints and guided path:** A sequence of 4–6 stops proposes a structured visit. Explicit numbering (1→2→…→n) avoids logical jumps and helps those who access for the first time to orient themselves, especially in VR where the space can be disorienting.
- **Welcome and rules panel:** Placed at the spawn point, it explains in 70–90 words how to move (keys, teleport), how long the visit lasts and where to find accessible content. This initial information reduces interface anxiety and makes the experience more inclusive.
- **Integrated accessibility:** Alt-text for key images makes the content interpretable by assistive technologies. Ample contrast prevents visual fatigue. Short text blocks facilitate reading. Avoiding automatic movements protects those sensitive to motion sickness. Audio and video must always have textual alternatives.





Photography on Freepic

CONFIGURING INTERACTIVITY THROUGH TRIGGERS

Below is a common use case: associating an audio narration with an image.

- **Target Object Selection:** Inside the virtual space, click the image to which you want to associate the audio. The selected object will be highlighted, usually with an outline or a selection box.

- **Access to the Interactions Panel:** With the object selected, look in the inter- face for an option or icon related to interactivity (often labeled “Add Interac- tion,” “Triggers,” or represented by an icon such as a magic wand).

Definition of Trigger and Action: In the panel that opens, you must configure two main parameters:

1. **Trigger (Cause):** Select from the list the “On Click” option (when the user clicks).

2. **Action (Effect):** Select from the list the “Play Audio” option (play an audio file).

- **Linking the Media File:** After selecting the action, the system will ask you to specify which audio file to play. Select the desired MP3 file from your comput- er. Save the configuration. From this moment on, every visitor who clicks on that image will trigger playback of the linked audio file. This same logic can be applied to start videos, show informational texts or link to external websites.

Before publication, it is essential to check each interactive element:

Is the object that initiates the interaction clearly visible and logically positioned?
Is the chosen activator (“On Click,” “On Proximity,” etc.) intuitive for the visitor?
Is the reaction (“Play Audio,” “Open Link,” etc.) consistent with the object and the educational intent?
Is the linked media file (audio, video, text) correct and functional?



PUBLISH, SHARE, VIEW STATS

The final stage consists of making the exhibition space accessible to the public and analyzing usage data to evaluate its impact.

Visibility and Publication Settings: Locate the "Share" button, usually placed at the top right. This will open a panel to manage access permissions.
The standard options are:

- **Private:** Accessible only to the creator and to collaborators invited via email. Useful during the setup phase.
- **Anyone with the link:** Accessible only to those who have the direct URL.
  It is the recommended option to share the project with a class or defined group.
- **Public:** The space becomes publicly searchable on the Spatial.io portal and indexable by search engines. After selecting the desired option, confirm to publish the space and generate the unique sharing link.
- **Sharing the Link:** Copy the generated URL and distribute it through the chosen communication channels (e.g., school register, email, school website).
- **Monitoring and Statistics (Analytics):** Platforms like Spatial.io provide a data analysis section for published spaces. By accessing this section from your dashboard, you can view quantitative metrics that help understand audience behavior, including:

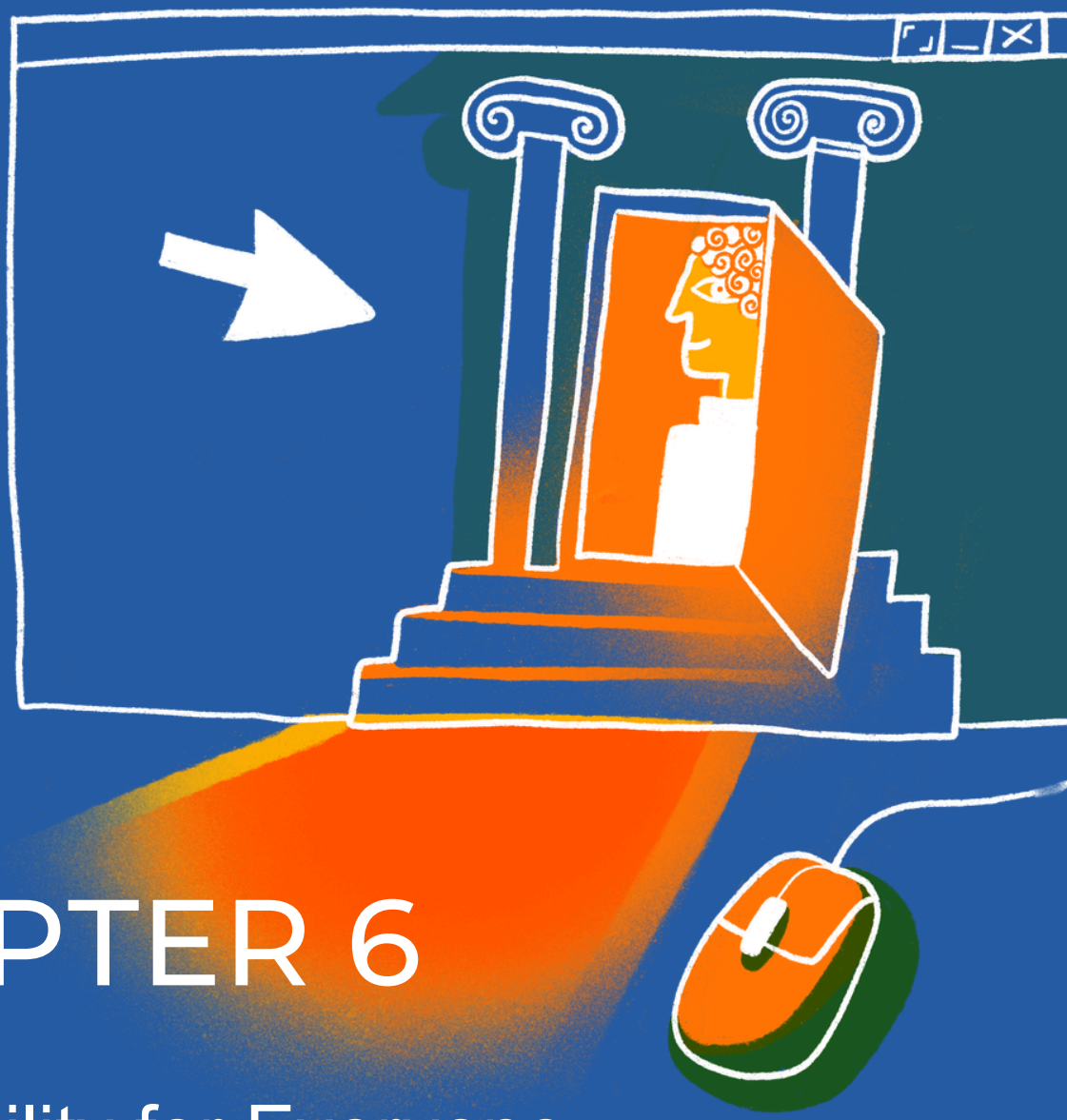
Number of Unique Visitors: How many different people visited the space.
Average Session Duration: The average duration of a visit.
Interactions: Which objects received more clicks or attention. The analysis of these data is fundamental to assess the effectiveness of the exhibition and to guide the design of future virtual shows.

To facilitate access from **mobile devices**, it is highly recommended to **convert the sharing link into a QR code**. A QR code is a matrix image that, when framed with a smartphone camera, automatically redirects the user to the corresponding web address. This code can be printed on informational materials, posters or displayed in physical places (e.g., the school notice board) to create an immediate bridge between the real and the virtual environment.



MINI-TROUBLESHOOTING (8 COMMON ISSUES)

- **3D model out of scale:** If the object appears enormous or microscopic, adjust the scale and verify the export units (meters or centimeters). Aligning this aspect prevents repeated adjustments in the scene.
- **Floating object:** An incorrect pivot makes the object appear suspended. Correct it in the 3D software or, in the scene, use the “Snap to floor” option to lay it on the ground.
- **Heavy scene or lag:** Polygons and textures that are too detailed slow down fruition. Reducing geometric complexity, compressing images and limiting videos to ≤ 60 seconds significantly improves performance.
- **Muted audio:** Before looking for complex errors, check system volume and browser permissions. In any case, the transcript allows access to information even if the audio does not start.
- **Missing subtitles:** If subtitles do not appear, check the .srt file (UTF-8 encoding and correct timecodes). If support is lacking, you can embed the text in the video, maintaining good readability.
- **Unclickable hotspot:** It is often hidden by other elements or too low/high. Bringing it to 1.4–1.6 m, increasing the activation radius and avoiding overlaps makes it more usable.
- **Teleport blocked:** Invisible colliders or non-“navigable” surfaces prevent movement. Removing obstacles, enlarging the floor collider and verifying navigation solves it in most cases.
- **Collaboration permissions:** If a colleague does not see the editing options, they likely do not have the correct role. Keeping Owner for those who co-ordinate and assigning Editor only to trusted reviewers prevents unwanted changes.



CHAPTER 6

Accessibility for Everyone

WHY IT MATTERS

A truly inclusive digital museum experience ensures that all users — including people with physical, visual, auditory, or cognitive disabilities — can explore and learn from cultural heritage equally. Accessibility is not just a technical feature; it represents the project's core values of equity, inclusion, and universal participation. By integrating accessibility from the design phase, we avoid barriers, increase participation, and promote diversity in learning.

COMFORTABLE MOVEMENT AND NAVIGATION

Purpose: To make sure that every visitor can move through the virtual museum easily and intuitively, regardless of their physical abilities or device type. Provide keyboard navigation (Tab, Enter, Arrow keys). Ensure clickable buttons and menus are large and clearly labelled. Include a "Return to Main Menu" or "Home" icon on each screen. Optimize scrolling, zooming, and object rotation. Provide clear visual focus indicators for keyboard users.

READABLE COLOURS, FONTS, AND TEXT-TO-SPEECH

Purpose: To ensure that all text and visuals can be easily read and understood by users with low vision, dyslexia, or colour blindness. Follow WCAG 2.1 contrast ratio ≥ 4.5:1 between text and background. Use the MUSED colour palette: Blue #2458A0, Orange #F29100, Grey #666. Use Arial only: 11 pt for body text, 14 pt bold for section titles. Provide text-to-speech functionality or reader support. Offer audio descriptions for visual content. Include a "Change Text Size" button where possible.

ALL-TEXT, CAPTIONS, AND SUBTITLES

Purpose: To ensure that visual and audio materials are accessible for visitors with visual or hearing impairments. All images must have descriptive alt-text (≤140 characters). All videos must include subtitles (.srt or .vtt). Audio recordings must have plain-text transcripts. Provide captions for meaningful sounds. Use a consistent caption style: 9 pt italic, centered.

Quick Accessibility Checklist:

Check Item	Status
All images have descriptive alt-text	☐
Videos include subtitles or captions	☐
Audio materials have transcripts	☐
Colour contrast meets WCAG standards	☐
Screen reader compatibility tested	☐
Fonts and layouts are clear and uniform	☐
No flashing or time-limited visuals	☐
Accessibility reviewed by real users	☐

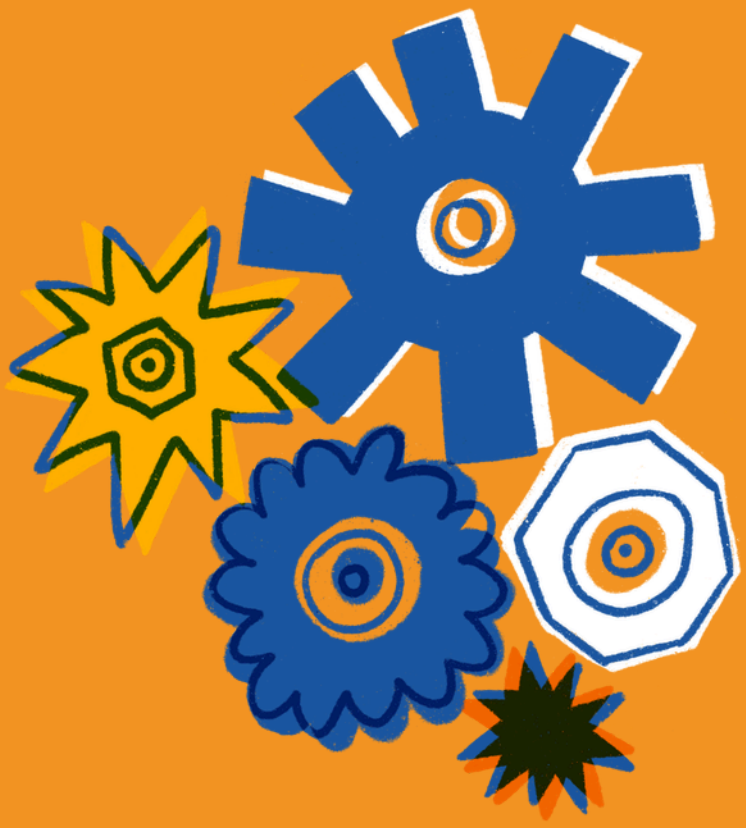
Tips and Good Practice

Tip: Use online tools such as WAVE or Google Lighthouse to check accessibility.

Warning: Avoid decorative images without alt-text; they confuse screen readers.

Checklist: Each partner should conduct at least one accessibility test before upload.





CHAPTER 7

Checks and Risks





INTRODUCTION

After designing and building the virtual museum, a crucial and indispensable stage is its verification. This is the last moment to ensure that everything works according to plan, and that the visitor experience will be positive, engaging, and seamless.

This chapter will guide you through the detailed process of user testing, systematic bug management, thorough verification of copyrights for all multimedia materials, and the preparation of a robust emergency plan. Careful execution of these steps is essential for your museum to be professional, legal, and resilient to unforeseen problems, which builds trust and project credibility.

USER TRIALS

User testing is a fundamental step that allows you to verify whether the virtual museum is intuitive, engaging, and accessible to its target audience. The opinions and observations of future users are invaluable in identifying problems that the creators, immersed in the project, might have overlooked.

The main goal is to check how real users interact with virtual space.



Photography on Freepik



Photography on Freepik

We want to find out:

Navigation and Orientation: Is the navigation simple and understandable? Do users know where they are and how to get to the content that interests them?

Functionality: Do all interactive elements (buttons, links, 3D models, video players) work correctly and as expected?

Understanding and Engagement: Is the message and content clear, interesting, and engaging? Is the story told by the museum coherent?

Accessibility: Is the museum accessible to people with different needs (e.g., text readability, color contrast, functioning video captions, screen read- er support)?

Overall Impressions: What are the general impressions and emotions accompanying the visit? Is it frustrating or satisfying?

How to conduct tests – detailed methods:

1 **Tester Selection:** Invite people from your target group (students of different ages, teachers of various specializations, parents), but also a few people from outside it to get a broader perspective. A group of 5-8 people is enough to identify about 85% of usability problems. Ensure diversity in your test group.

2 **Scenario Preparation:** Create a list of specific, open-ended tasks for the testers to perform. Avoid leading them by the hand.

Example of a bad task: *"Click on the menu, select '19th Century Gallery', and then find the painting 'Battle of Grunwald'."*

Example of a good task: *"Imagine you are interested in the history of medieval Poland. Find an exhibit in the museum related to this period and learn something more about it." Other example tasks: "Start the audio guide for the sculpture you like the most.", "Find out the opening hours of the physical museum.", "Try to share a link to the exhibition on social media."*

3 **Testing Methods:**

Moderated Test: You conduct the session with the user (live or remotely via screen sharing). You can ask additional questions and observe reactions. This is very valuable but time-consuming.

"Think Aloud" Protocol: Ask users to verbalize their thoughts, intentions, and feelings as they perform the tasks. This will help you understand why they make certain decisions and where they encounter cognitive barriers.

Unmoderated Test: Users perform the tasks on their own, and their interactions are recorded by special software (e.g., Maze, Lookback). This is faster and allows you to test a larger number of people.

Testing Method	Description	Key Advantages	Key Disadvantages
Moderated Test	Session conducted with the user live or remotely via screen sharing, led by a moderator.	Ability to ask supplementary questions, observation of non-verbal reactions.	Time-consuming, requires greater moderator involvement.
“Think Aloud” Protocol	User verbalizes their thoughts, intentions, and feelings while performing tasks.	Helps to understand cognitive processes and barriers.	Can feel unnatural for some testers, requires an experienced moderator.
Unmoderated Test	Users perform tasks independently, and their interactions are recorded by specialized software.	Fast, allows testing a larger group, lower cost.	Lack of opportunity to ask follow-up questions during the task.

4 Gathering Feedback and Measuring Satisfaction:

Post-test Interview: After the session, conduct a short interview. Ask open-ended questions: “What was the most difficult part for you?”, “Which element did you like the most and why?”, “Did anything surprise you?”, “Do you have any suggestions for improvement?”.

Satisfaction Surveys:

- System Usability Scale (SUS): A standard, 10-question questionnaire that provides an overall usability score on a scale of 0-100. It is quick to complete and allows for comparing results between different project versions.
- Simple Survey: If SUS seems too complicated, create your own short survey with questions rated on a 1-5 scale (e.g., “How do you rate the ease of navigation?”, “How do you rate the visual appeal of the museum?”).
- Best Practices for Receiving Feedback: Be open to criticism – remember, you are testing the project, not yourself. Listen actively, do not interrupt. If you don’t understand something, ask for clarification: “Can you show me where that was?”

5 Analysis of results:

After collecting the data (notes, recordings, surveys), analyze it for recurring patterns. If three out of five users had trouble finding the exit from a room, it means the navigation signage needs urgent improvement. Create a list of problems and prioritize them – from those that prevent users from using the museum to minor inconveniences.

BUG LISTS AND FIXES



Systematic bug management is key to ensuring the technical quality of the project. Creating a central bug list allows for effective tracking and prioritization of repair work.

Tools for creating a bug list:

Simple: A shared Google Sheet or Microsoft Excel is a great start for small projects.

Visual: Trello or Asana allow for the creation of Kanban boards, where "cards" with bugs are moved between columns (e.g., "New," "In Progress," "For Verification," "Done").

Advanced: Jira is a professional tool used by development teams, offering extensive tracking and reporting options.

Creating a detailed bug list: Each identified bug should be recorded as a separate entry and include:

Bug ID: A unique number (e.g., MUSED-001).

Title: A concise description of the problem (e.g., "Video in 'Modern Art' room does not play on Firefox").

Description: A more detailed description, including what happens versus what should happen.

Steps to Reproduce: A numbered list of steps that allows the bug to be reliably triggered.

Priority:
Critical (Blocker): Prevents the use of a key feature or the entire application (e.g., the page does not load).
High: Seriously disrupts a major feature, but a workaround exists (e.g., the main navigation button doesn't work, but you can navigate from the sitemap).
Medium: Causes inconvenience but does not block the main user flow (e.g., an image is displayed incorrectly on a mobile phone).
Low: A minor visual glitch or a typo.

Status: The current state of work (e.g., New, In Progress, For Verification, Done, Rejected).

Assignee: Who is responsible for the fix.

Attachments: Screenshots or a short video recording showing the bug.

Repair process and example solutions:

Reporting: Encourage the entire team and testers to report bugs precisely.

Prioritizing: Regularly (e.g., once a day) review the list and set priorities

Fixing: Assign tasks to the appropriate people.

Verification: After a bug is fixed, the person who reported it (or a dedicated tester) must check if the problem has been resolved on different devices and browsers.



Photography on Freepik



Photography on Freepik

Common problems and suggested solutions:

Problem: Users get lost in navigation.

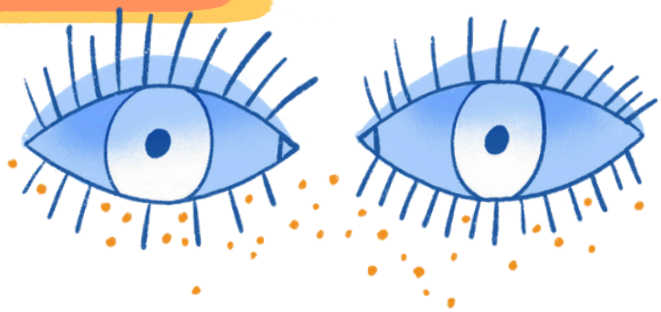
- **Solution A:** Add an interactive museum map with the user's current position marked.
- **Solution B:** Introduce a system of "hints" or a virtual guide that suggests the next steps.
- **Solution C:** Simplify the navigation menu by reducing the number of options.

Problem: The page loads too slowly.

- **Solution A:** Compress all images and 3D models without a visible loss of quality (use tools like TinyPNG, Blender).
- **Solution B:** Optimize videos – make sure they have the appropriate resolution and format (e.g., MP4 with H.264 codec).
- **Solution C:** Check if the hosting is powerful enough.

COPYRIGHT CHECKS FOR IMAGES/AUDIO/VIDEO

Every multimedia element used in the virtual museum must comply with copyright law. Neglecting this aspect can lead to serious legal and financial consequences.



Sources of materials and tools:

Own materials: The safest option.

Materials on free licenses: **Images:** Search on Wikimedia Commons, Unsplash, Pexels, Rijksmuseum Studio (public domain artworks). **Sounds:** Freesound, Bensound. **Video:** Pexels Video, Mixkit. Always check the specific terms of the license (e.g., CC BY requires attribution).

Author's consent: If you want to use copyrighted material, you must obtain written permission.



Photography on Freepik



Photography on Unsplash

Attribution examples:

	File ID	File Name	Type	Location in Museum	Source (URL)	License Type
1	IMG-045	MonaLisa_HQ.jpg	Image	Renaissance Gallery	www.rijksmuseum.nl	Public Domain (PD)
2	AUD-012	Medieval_Lute.mp3	Audio	Medieval Section Intro	www.freesound.org	CC BY-SA 3.0
3	VID-007	Volcano_Eruption.mp4	Video	Geology Room	www.pexels.com/video	Pexels License
4	IMG-088	Rare_Coin.png	Image	Numismatic Cabinet	Unknown (Found on Google)	Unknown

Required Attribution

1 – None (Rijksmuseum Studio)
2 – Yes: “Lute Music” by Author X (CC BY-SA)
3 – None
4 – None

Status

1 – OK
2 – OK
3 – OK
4 – Problem (Remove!)

Detailed verification process:

1. **Create a media inventory:** In a spreadsheet, create a table with the columns: File ID, File Name, Type (Image/Audio/Video), Location in museum, Source URL, Author, License Type, Required Attribution Method, Verification Date, Status (OK/Problem).
2. **Determine source and license:** For each file, fill in the spreadsheet. Be a detective – if you are unsure about the license, do not use the material.
3. **Correct attribution:** Make sure you meet the conditions. Correct attribution or a CC BY license looks like this: “[Title of work]” by [Author] is licensed under [CC BY 4.0]. The title should link to the original, and the license name to the license text.
4. **Store evidence:** In a separate folder, keep screenshots from source pages with visible license information and email correspondence with authors who have given their consent.

Remember: “Found on Google” is not a license! Use Google Images with the “Usage rights” filter set to “Creative Commons licenses”.

EMERGENCY PLAN

Even the best-prepared project can encounter unexpected problems. Having an emergency plan will allow you to react quickly and effectively to crisis situations.

Detailed risk analysis:

- **Technical problems:** Server failure, platform errors (e.g., Spatial.io), bugs after a browser update.
- **Hacker attacks:** Unauthorized access, malicious code injection (XSS), content alteration (defacement), user data leakage.
- **Negative feedback:** Substantive criticism, hate speech on social media, an unfavorable review in the media.
- **Copyright issues:** A claim of copyright infringement after publication.

Expanded elements of the emergency plan:

1 Backups:

The 3-2-1 Backup Strategy:
3 Copies of your data (Original + 2 Backups) On **2** Different media (e.g., Server disk + External/Local drive) With **1** Copy Off-site (e.g., In the cloud - Off-site)

Automation
Configure daily, automatic backups of the entire site/application and database

Testing
At least once a quarter, perform a test restore from a backup to ensure the process works.

2 Monitoring:

Tools: Use a free tool like UptimeRobot, which checks if your site is online every 5 minutes and will email you in case of a failure.

Server Logs: Regularly review logs for suspicious activity.

3 Crisis Communication Plan:

Who is responsible? Designate one person (and their deputy) as the "crisis officer" responsible for communication.

Prepared Messages:

- **Technical failure:** "Dear visitors, we are currently experiencing technical problems with our virtual museum. Our team is already working on a solution. We apologize for the inconvenience and thank you for your patience. We will keep you updated on the progress." (to be placed on the homepage and social media).

- **Hacker attack (if no data was leaked):** "We have identified and blocked an unauthorized interference with our platform. We have restored full security and functionality. No user data has been compromised."

- **Contact list:** Create an emergency contact list: hosting provider, platform technical support, server administrator, lawyer (in case of legal issues).

4 Detailed response procedure:

- **Technical failure:**
  1. Publish the announcement.
  2. Contact technical support.
  3. If possible, restore the last stable version from backup.
  4. After resolving theproblem, publish a message about the restoration of service.

- **Security problem:**
  1. Immediately switch the site to maintenance mode.
  2. Change all passwords(administrator, database, FTP).
  3. Restore the site from a clean backup.
  4. Identify and patch thesecurity vulnerability (e.g., by updating software).

- **Copyright infringement:**
  1. Immediately remove the disputed material.
  2. Respond to the claim, informing about the steps taken.
  3. Consult a lawyer to determine further action.



CHAPTER 8

Concrete, localized examples to inspire and educate



STUDY CASE 1 - “BAROQUE SPACES”, MUSEO NACIONAL DEL PRADO, SPAIN

1 – Project details

Virtual Museum Name	“Baroque Spaces” (*Espacios Barrocos*)
Institution / Organisation	Museo Nacional del Prado, Madrid, Spain
Institution type	Museum
City & Country	Madrid, Spain
Website (if any)	https://www.museodelprado.es/recurso/espacios-barrocos/

2 – Virtual Museum Overview

Short description	“Baroque Spaces” is an interactive webdoc educational project launched by the Museo del Prado in collaboration with Samsung. It enables students (upper primary and secondary) and teachers to explore the richness of the Baroque era through audiovisual capsules, interactive resources, and a transmedia narrative connecting 17th-century art with contemporary concerns.
Creation / launch date	January 2025
Public link (URL)	https://content3.cdnprado.net/imagenes/proyectos/personalizacion/7317a29a-d846-4c54-9034-6a114c3658fe/ElPrado/interactivos/espacios-barrocos/index.html



3 – Content & Themes

Main themes / collections	Main themes include: Understanding Space - Time - Inhabiting space - Looking at the sky Empty Space - Theatricalization of the spiritual - Worship spaces - Death	Occupied Space - Everyday spaces - Health and education - Food - Marginal spaces Simulated Space - Baroque theatre - Musical spaces - Literary spaces - Festivities and leisure
Content type	2D images	
Why is it unique / innovative?	The project is an interactive web documentary (Webdoc) that provides a set of educational resources, allowing users to explore the Prado Museum's Baroque collection. The Webdoc enables filtering by knowledge area, educational level, and topic of interest, allowing users to seleact artworks for personalised tours in the classroom, at home, or within the museum itself from any device.	

The digital tools used are:

1. Audiovisual capsules: Fifteen (15) capsules that allow students to explore different aspects of the Baroque period through educational videos. These videos guide the audience through this digital experience with scenes recorded inside the Prado Museum.

2. Interactive resources: The project includes interactive resources such as games, interactive images, and biographies of key Baroque figures. Tools like Genially are used to facilitate student learning and comprehension, making it an accessible resource.

3. Transmedia narrative: The project's transmedia structure allows users to immerse themselves in 17th-century daily life, religious spaces, leisure, and societal concerns. Students can design personalized tours through subthemes such as "Looking at the Sky", "Everyday Spaces", or "Baroque Theater".

These digital tools enable students to explore and learn about the Baroque period in an interactive and engaging way, enriching their educational experience.



4 – Objectives & Impact

Educational / cultural goals	The main objective of the “Baroque Spaces” project is to bring the richness of Baroque art closer to students and teachers in the final cycle of Primary and Secondary education. Through audiovisual capsules, interactive resources and a transmedia narrative.

The project aims to:

1. Foster dialogue between art and contemporary society: Enable students to understand and appreciate Baroque art in the context of their daily lives and current environment.

2. Enrich the educational experience: Provide innovative educational resources that facilitate the learning and exploration of Baroque art in an interactive and engaging way.

3. Promote the use of digital technologies in education: Integrate digital tools into the school curriculum to enhance accessibility and the quality of arts education.

4. Develop critical and creative skills: Encourage critical thinking and creativity among students through the exploration and analysis of Baroque art.

This project offers students the opportunity to connect with art in a more dynamic way.

Target audience	Students, General public, Researchers, Families

Results & impact	With the Baroque Spaces project, the Prado National Museum aims to open its doors to all audiences and extend beyond the physical space into the digital realm, offering a much more dynamic learning experience that can be applied both in the classroom and in personal settings. This flexibility facilitates its implementation in various educational contexts.

The expected outcomes of the project are:

1. Improved learning: Students are expected to gain a deeper and more meaningful understanding of Baroque art and its historical and cultural context.

2. Development of critical and creative skills: The project seeks to foster critical thinking and creativity among students through the exploration and analysis of Baroque art.

3. Integration of digital technologies: It is anticipated that students and teachers will become more familiar with the use of digital tools in education, enhancing their technological competencies.

4. Encouraging dialogue between art and contemporary society: The project aims to connect Baroque art with students’ daily lives and current environments, promoting a broader and more contextualized understanding of art.

5. Accessibility and educational equity: By utilizing digital resources, the project seeks to make art accessible to a larger number of students, regardless of their geographical location or economic situation.

5 – Creation Process & Collaborations

Team involved

Project and Content Direction – Museo Nacional del Prado
Ana Moreno Rebordinos, Pablo González Iglesias, Amalia Vaquero Martín

Scientific Research, Content Development, Scripts, and Web Files
Ana María Valtierra Lacalle
Executive Production
Sayavera Studio, María Yin
General Executive Direction
María Yin

Creative Direction and Art Direction
María Yin, Sayavera Studio

Web
UX/UI: Lorena Sayavera
Web Development: Metódica

Video
Producer: Walden Studio
Director and Editor: Aitor Saavedra
Head of Production and Postproduction: Olivia Cabello
Assistant Director: Inés de la Hoz
Gimbal Operator: Javier Piera
Assistant: Kristhian Zacarías
Sound Director and Postproduction: Daniel Bravo

Casting: María Pradera, Olivia Cabello, Lorena Sayavera

Actress: Andrea de San Juan

Costume, Props, Makeup & Hair:
María Pradera

Animation
Direction: María Pradera, Juan Pajares Flextatowa
Script: Olivia Cabello, Aitor Saavedra, María Pradera, Juan Pajares Flextatowa
Animation: Juan Pajares Flextatowa, María Gil, Enrique Guillamón, Miguel Sánchez
Graphic Design: María Pradera, Patricia Bolinches, Juan Pajares Flextatowa, Lorena Sayavera, María Gil, Enrique Guillamón

Special Thanks
María Francisca Gallego, Cristina Artés González, Irene Pomar Marcos, and the entire



CASE STUDY 2 - MUSEO EGIZIO, TURIN, ITALY





1 – Project details

Virtual Museum Name	Museo Egizio Virtual Tour & 3D Collections
Institution / Organisation	Museo Egizio (Turin, Italy)
Institution type	Museum
City & Country	Turin, Italy
Website (if any)	*https://www.museoegizio.it/en/*

2 – Virtual Museum Overview

Short description	The Museo Egizio offers a free Virtual Tour that allows visitors to explore galleries in 360°, with hotspots linking to object pages, videos, and textual insights. In parallel, the museum maintains a public Sketchfab profile with an extensive and growing 3D collection, complementing the room-scale context with object-level close-up inspection. The integration of 360° tours and 3D models creates a true virtual museum, complete with captions, descriptions, and multimedia enrichments (text, audio, video), all freely accessible online.
Platform used	Web-based 360° viewer (virtualtour.museoegizio.it), institutional web pages for tours, Sketchfab for 3D models, and YouTube/video for supporting content.
Creation / launch date	Virtual tours have been published and updated over time; new sections and updates announced in news items (e.g., Gallery of the Kings, 31 July 2025).
Public link (URL)	Virtual Tour: *virtualtour.museoegizio.it* Virtual Tours page: *museoegizio.it/scopri/tour-virtuali/* Kids virtual tour: *https://virtualtourragazzi.museoegizio.it/* 3D Gallery: *sketchfab.com/Museoegizio*

3 – Content & Themes

Main themes / collections	Ancient Egyptian collections: statues, stelae, sarcophagi, figurines, everyday objects; dedicated tours include Deir el-Medina and the Tomb of Kha and Merit.
Content type	2-D images, 3-D models,Video, Audio, Text panels, 360° tour
Why is it unique / innovative?	It combines room-scale navigation (360°) with object-centric inspection (3D), accessible free of charge via the web and without app installation. Users can move seamlessly between the museum context and detailed study of individual artifacts, supported by captions, descriptions, and media for education, research.

4 – Objectives & Impact

Educational / cultural goals	Provide free remote access to heritage; support schools and universities with high-quality, reliable content; promote inquiry-based learning and inclusion (the museum also provides IT/EN versions and subtitled educational videos).
Target audience	Students, General public, Researchers, Families
Results & impact	The Museo Egizio's Sketchfab profile currently lists around 145 public models (collections and individual artifacts), confirming the scale of its digital holdings. These resources are widely reused in educational and outreach contexts.

5 – Creation Process & Collaborations

Team involved	Museum curators and digital/media team; education and communication units; technical partners for 3D digitisation and processing (acknowledged on object pages).
Main project phases	Selection of works → 360°/3D capture and audiovisual production → metadata and captions → 360° tour authoring and web publishing → updates and outreach.
External collaborators	Collaborations with universities, research groups, and technical partners, credited on public platforms per object or collection.

CASE STUDY 3 - THE MOST BEAUTIFUL VILLAGES IN ITALY





1 – Project details

Virtual Museum Name	Mu.Di The Virtual Museum of the Most Beautiful Villages in Italy
Institution / Organisation	Associazione “ I borghi più belli d’Italia”I Borghi più belli d’Italia The Most Beautiful Villages in Italy
Institution type	Museum
City & Country	Rome, Italy
Website (if any)	*https://museovirtuale.borghipiubelliditalia.it*
Primary contact for information	info@borghipiubelliditalia.it

2 – Virtual Museum Overview

Short description	The Mu.Di. is a virtual museum but, above all, a cultural hub that showcases the richness of Italy’s most beautiful villages. So far, 315 villages have joined the initiative, highlighting a cultural heritage that goes beyond the major cities. The Mu.Di. offers the chance to explore a widespread museum that, through high-tech scanning of artworks, sophisticated virtual reality techniques, 3D modelling, and advanced rendering, makes it possible to enjoy works currently preserved in these 315 villages in an immersive way, also organizing engaging virtual exhibitions. It’s a new way to discover the treasures of an Italy still waiting to be explored.
Platform used	The website was developed by KooTj, and the virtual tours were created with 3DVista.

Creation / launch date	Virtual museum have been published in the 2024 and updated over time; new sections and updates announced in news items.
Public link (URL)	Home: https://museovirtuale.borghipiubelliditalia.it/museovirtuale.borghipiubelliditalia.it Virtual Tour di test: https://museovirtuale.borghipiubelliditalia.it/virtual-tour/test-virtual-tour/museovirtuale.borghipiubelliditalia.it Works archive: https://museovirtuale.borghipiubelliditalia.it/archivio-opere/museovirtuale.borghipiubelliditalia.it Contacts: https://museovirtuale.borghipiubelliditalia.it/contatti/museovirtuale.borghipiubelliditalia.it Hall virtuale / area centrale del tour: https://museovirtuale.borghipiubelliditalia.it/vt/hall/ CONT.G.NEWS+1

3 – Content & Themes

Main themes / collections	A collection of works originating from churches, museums, palaces, and historic sites of the participating villages. Each piece is accompanied by detailed records, curiosities, and descriptions of its context and provenance.
Content type	Digital museum / cultural heritage collection – curated artworks and artifacts from Italian villages. Virtual tours / 360° experiences – immersive online visits to artworks and locations. 3D/VR experiences – interactive environments and high-resolution 3D models. Art & history information pages – descriptive texts, provenance details, and cultural context. Exhibition/educational content – themed virtual exhibitions and learning resources.
Why is it unique / innovative?	Mu.Di. is unique and innovative because it transforms Italy's widespread village heritage into a single, always-open digital museum. Through high-resolution 3D scanning, advanced rendering, and immersive virtual tours, it allows anyone anywhere to experience artworks that normally remain scattered across more than 300 small towns—places often hard to visit in person. This combination of cultural preservation, nationwide reach, and cutting-edge virtual technology sets Mu.Di. apart from traditional museums or standard online galleries.

4 – Objectives & Impact

Educational / cultural goals	• Preserve and share heritage – Digitally safeguard artworks and architecture from more than 300 Italian villages, ensuring long-term access even if the physical sites are remote or fragile. • Promote widespread cultural access – Allow anyone, anywhere, to explore Italy's small-town artistic treasures without the limits of travel or opening hours. • Educate through immersive experiences – Use high-resolution 3D scans, virtual tours, and interactive storytelling to teach history, art, and local traditions in a more engaging way. • Support local communities – Highlight lesser-known villages to encourage cultural tourism and sustainable economic benefits. • Foster appreciation of diversity – Showcase the regional variety of Italy's art, architecture, and craftsmanship, broadening understanding of national and local identities.

Target audience	• Art and culture enthusiasts – People interested in Italian art, architecture, and history who want to explore beyond the major cities. • Students and educators – Schools, universities, and researchers seeking high-quality digital resources for art history, heritage studies, and immersive learning. • Travellers and cultural tourists – Visitors planning trips to Italy who wish to preview or discover lesser-known villages. • Local communities and municipalities – Small towns looking to promote their heritage and attract sustainable tourism. • General public worldwide – Anyone curious about Italy's cultural richness but unable to visit in person.
Results & impact	The Mu.Di's Sketchfab profile currently presents roughly 489 public 3D models (spanning both collections and individual artifacts), highlighting the breadth of its digital holdings. These resources can be used for education and outreach initiatives.

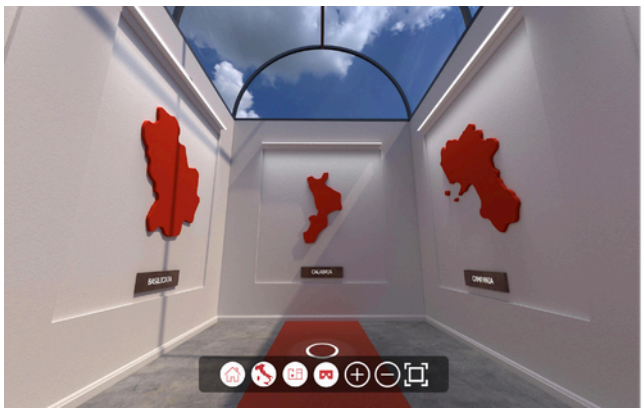
5 – Creation Process & Collaborations

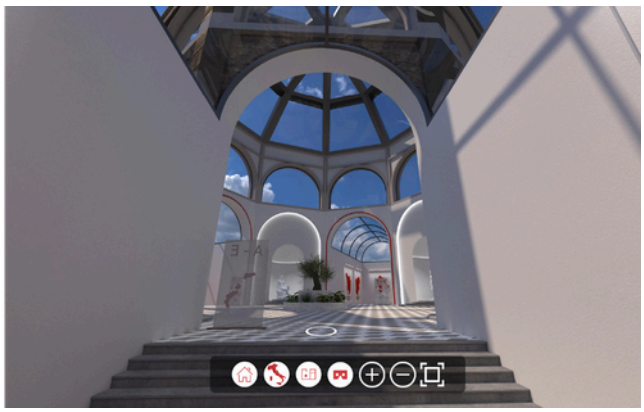
Team involved	Associazione "I Borghi più belli d'Italia" – the cultural organization that conceived and promotes the Mu.Di. project as part of its mission to preserve and share the heritage of Italy's most beautiful villages. KooTj – the digital agency listed in the site footer as "Powered by KooTj", responsible for the website's design, development, and overall digital platform. 3DVista – the professional software used to create the immersive 360° virtual tours integrated into the site.
Main project phases	1. Concept & Planning - Definition of goals: create a nationwide digital museum for Italy's most beautiful villages. - Partnership agreements between the Associazione I Borghi più belli d'Italia and the digital agency KooTj. - Selection of pilot villages and artworks to include. 2. Content Collection & Digitization - High-resolution photography and 3D scanning of artworks and architectural spaces in over 300 villages. - Collection of historical, descriptive, and educational metadata for each piece. 3. Platform Design & Development - Website architecture and UX design by KooTj. - Integration of multimedia content and database of artworks. - Setup of hosting, security, and content management system. 4. Virtual Tour Production - Creation of immersive 360° tours using 3DVista software. - Advanced rendering, 3D modeling, and VR features. 5. Testing & Quality Assurance - Cross-device testing (desktop, mobile, VR headsets). - Accessibility and performance optimization.

6. Launch & Public Release
- Official rollout of the Mu.Di. website and first set of virtual tours.
- Promotion through the Associazione's national network and media coverage.

7. Ongoing Updates & Expansion
- Continuous addition of new villages, artworks, and exhibitions.
- Maintenance of the platform, periodic technological upgrades, and new virtual events.

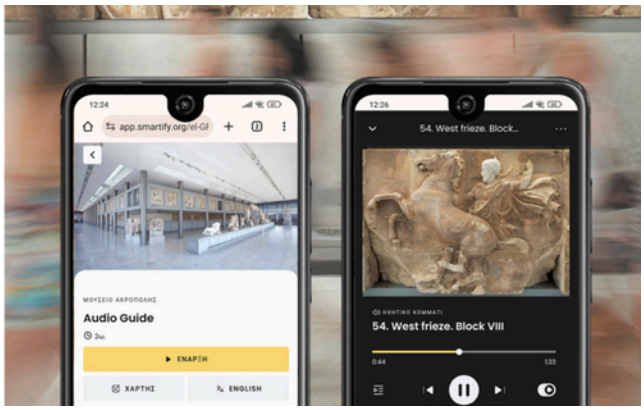
External collaborators	Participating villages and local cultural institutions – more than 300 individual borghi and their local museums, parishes, and archives that provided artworks, historical data, and access for digitization.





CASE STUDY 4 - DIGITAL ACROPOLIS MUSEUM, GREECE





1 – Project details

Virtual Museum Name	Digital Acropolis Museum
Institution / Organisation	Acropolis Museum Dionysiou Areopagitou 15, 11742 Athens
Institution type	Museum
City & Country	Athens, Greece
Website (if any)	*https://www.theacropolismuseum.gr/en/digital-museum*

2 – Virtual Museum Overview

Short description	The Digital Acropolis Museum is an immersive digital platform that allows users to explore the galleries and collections of the Acropolis Museum online. It provides a high-resolution, 360° interactive environment where visitors can navigate through the museum's spaces and zoom in on artifacts. The project aims to extend the museum's physical experience to a global audience, promoting education, accessibility, and cultural engagement through.
Platform used	Web-based platform using 3D scanning, 360° imaging, and interactive digital storytelling tools, media players.
Creation / launch date	2020 (expanded digital services after COVID-19)
Public link (URL)	*https://www.theacropolismuseum.gr/en* *https://www.theacropolismuseum.gr/en/virtual-tour-acropolis-museum* *https://www.theacropolismuseum.gr/en/digital-guide*

3 – Content & Themes

Main themes / collections	The virtual museum focuses on the archaeological heritage of the Acropolis of Athens. Its main themes include the Archaic and Classical periods, the Parthenon sculptures, the everyday life of ancient Athenians, and the relationship between the monuments and their historical context.
Content type	Content types: 2-D images, 3-D models, Video, Audio, Text panels, VR, 360° tour.
Why is it unique / innovative?	The Acropolis Museum's virtual platform is unique for its combination of high-fidelity 3D reconstructions and narrative interpretation directly linked to the original archaeological site visible from the museum itself. It merges real and digital experiences, embodying a model of contextual museology. It provides unprecedented visual fidelity, allowing users to examine sculptures and architectural details in true scale and context. Through the integration of 3D photogrammetry, panoramic imaging, and structured metadata, the platform enables an immersive and research-oriented engagement with the museum's collections.

4 – Objectives & Impact

Educational / cultural goals	The virtual museum aims to make the cultural and educational value of the Acropolis accessible to a global audience. It supports teaching, research, and tourism, while promoting awareness of the importance of preserving world heritage. Through interactive and immersive experiences, it enhances understanding of ancient Greek art and architecture. The project has broadened access for international audiences, especially during the COVID-19 pandemic, and continues to serve as an educational tool for remote learning.
Target audience	General public, students, researchers, families.
Results & impact	The project has broadened access for international audiences, especially during the COVID-19 pandemic, and continues to serve as an educational tool for remote learning.

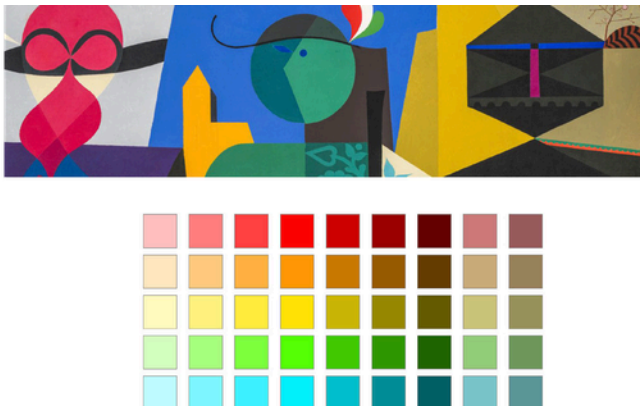
5 – Creation Process & Collaborations

Team involved	The virtual museum was developed by the Acropolis Museum's Digital Media and Education departments, in collaboration with the Greek Ministry of Culture and private technology partners. Phases included 3D digitization of artifacts, development of an online portal, integration of multimedia guides, and launch of virtual tours.
Main project phases	Data Entry: 27.755 digital files on 10.557 objects, among which all of the Museum exhibits, were inserted into the Museum Collections Database (MuseumPlus) Digitization: scanning of a big part of the archival records on the Museum collections-496 handwritten excavation logs were digitized as well as 110.000 photographs, 18.410 index cards, and 7.500 conservation reports of portable finds Photographing: 500 museum exhibits were photographed from all angles. The high resolution coloured digital photographs that were produced have enriched the museum's photographic archival material. 3D Scanning: 60 significant museum exhibits were scanned with the use of digital photogrammetry. Website: The creation of a website which forms the core of communication between the Museum and its public, offering equal and free access to the Museum collections and exhibits. "Acropolis Museum Kids": Creation of website for children between six and twelve years old from all over the world.
External collaborators	Smartify: For the Museum's Digital Guide, which is a free digital experience offering personalized, interactive access to the permanent collections. Cosmote: a collaboration with the Greek Ministry of Culture and Sports, with the support of the Acropolis Museum, to create COSMOTE CHRONOS, an augmented reality mobile application that revives the Acropolis at its peak. OTE S.A. National Documentation Centre: which collaborated on the creation of the Acropolis Educational Resources Repository. A.M.S. Archiving Services Ltd TALENT S.A., InDigital SA, Audigys, MainSys S.A.



CASE STUDY 5 - MUSEUMAP, HUNGARY





1 – Project details

Virtual Museum Name	MuseuMap
Institution / Organisation	MNM OMMIK Museum Methodology and Information Centre of the Hungarian National Museum
Institution type	Museum
City & Country	Budapest, Hungary
Website (if any)	*www.museumap.hu*
Primary contact for information	Rita Kovács – website editor – kovacs.rita@mnm.hu

2 – Virtual Museum Overview

Short description	The MuseuMap portal is an aggregation platform operated by the Museum Methodology and Information Centre of the Hungarian National Museum (MNM OMMIK). Since its launch in 2015, it has served as an online channel for Hungarian museum digitization, collecting digital museum records from across the country. In addition to the professional collection and publication of digital records, the portal also aims to present artefacts in an online spatial environment. Its range of services is continuously expanding to meet the needs of partner institutions and users. One such development is the MuseuMap Gallery, a subpage launched in 2020, which introduces the portal's materials in a more playful and accessible way.
Platform used	Sketchfab Platform, MuseuMap Gallery
Creation / launch date	2015

Public link (URL)	Kiállítások Sketchfab – *https://museumapgallery.mnm.hu/kiallitasok*

3 – Content & Themes

Main themes / collections	- The MuseuMap portal aggregates digital museum records from across Hungary. - It contains detailed metadata, descriptive texts, high-quality images, and in some cases 3D models of artefacts. - Collections come from partner museums nationwide, representing Hungary's cultural heritage in digital form. - The MuseuMap Gallery presents these materials in a playful and accessible way, with additional features such as virtual exhibitions, games, and thematic selections.
Content type	2-D images, 3-D models, Video, Audio, Text panels, Games/Quizzes, 360° tour
Why is it unique / innovative?	- It is the national aggregation platform for Hungarian museum digitization. - Offers integration with Europeana, connecting Hungarian museum data to the European cultural heritage network. - Provides AI-supported color search, enabling users to search artefacts based on visual color palettes. - Allows 3D model publication on multiple platforms (MuseuMap, Gallery, Sketchfab). - Users can create custom galleries and presentations (MyMuseuMap) downloadable in PDF or PPT format. - The MuseuMap Gallery uses gamified and interactive methods to make museum collections more engaging. It provides opportunity for a larger and more inclusive outreach.

4 – Objectives & Impact

Educational / cultural goals	- To support museum digitization and make Hungarian cultural heritage widely accessible online. - To engage the public through playful, interactive, and visually appealing digital tools. - Through the Museum History Hub (Learning menu), it supports education and digital learning with interactive teaching materials and explanatory videos. - Promotes cultural dissemination, heritage preservation, and public participation in the digital museum sphere.
Target audience	General public, students, researchers, families.
Results & impact	- National-level aggregation since 2015. - Continuous expansion of partner institutions and user services. - Increased international visibility for Hungarian museums through Europeana connection. - Broad public engagement through interactive exhibitions and games.

5 – Creation Process & Collaborations

Team involved	Operated by the Museum Methodology and Information Centre of the Hungarian National Museum (MNM OMMIK). Professional and methodological support team ensures high-quality digitization and platform development.
Main project phases	2015: Launch of the MuseuMap portal. 2020: Launch of the MuseuMap Gallery, expanding the platform with playful and interactive content. Ongoing: Continuous expansion of services, digitization support, and user engagement tools (AI search, 3D models, educational programs).
External collaborators	Partner museums across Hungary contributing digitized artefacts. See: MuseuMap - Partnereink Europeana, providing European-level aggregation and visibility. Sketchfab, hosting and displaying 3D models.

CASE STUDY 6 - MUSEUM AUSCHWITZ-BIRKENAU, POLAND

1 – Project details

Virtual Museum Name	Virtual Museum Auschwitz-Birkenau
Institution / Organisation	Auschwitz-Birkenau State Museum
Institution type	Archive
City & Country	Oświęcim, Poland
Website (if any)	www.auschwitz.org
Primary contact for information	Dr. Piotr M. A. Kowalski - Director of Digital Initiatives info@auschwitz.org



2 – Virtual Museum Overview

Short description	The Virtual Museum Auschwitz-Birkenau offers an immersive, online experience of the former Auschwitz concentration camp, providing a digital platform for historical education and remembrance. Visitors can explore key sites of the camp, including the barracks, gas chambers, and exhibits showcasing the lives of the victims of the Holocaust. The museum aims to ensure that the atrocities of the Holocaust are never forgotten while making this important historical site accessible globally. Launched in 2017, the virtual museum allows visitors to take self-guided tours through multimedia exhibitions, offering access to photographs, survivor testimonies, and educational content. This project, in collaboration with leading digital platforms, aims to reach a global audience, especially students and researchers, to engage in historical reflection and further learning. Through virtual technology, the museum provides an unprecedented level of accessibility, enabling people worldwide to witness the reality of life at Auschwitz and reflect on its deep cultural and historical significance. The museum's goal is to maintain the memory of the victims while educating future generations about the dangers of intolerance and hatred.
Platform used	The platform uses 3D imaging, video content, digital archives, interactive maps, and survivor testimonies. It employs Google Arts & Culture's virtual tour features for seamless navigation.
Creation / launch date	2017
Public link (URL)	https://panorama.auschwitz.org/tour1,en.html

3 – Content & Themes

Main themes / collections	History of Auschwitz concentration camp Holocaust education Survivor testimonies and stories War crimes and human rights violations
Content type	Video, Audio, 360° tour
Why is it unique / innovative?	This virtual museum is innovative due to its high level of immersion and accessibility, allowing people from around the world to experience the historical site digitally. The interactive 360° tours, survivor interviews, and digital archives make it an exceptional resource for education, particularly in teaching about the Holocaust and human rights.

4 – Objectives & Impact

Educational / cultural goals	- To educate a global audience about the atrocities of the Holocaust. - To preserve the memory of the victims of Auschwitz. - To promote understanding of human rights and combat intolerance and discrimination.
Target audience	Students (age from 12), General public.
Results & impact	- Over 2 million visitors annually. - 90% of educators and students reported a better understanding of Holocaust history after using the virtual tour. - Over 10,000 school groups have participated in digital learning activities through the platform.

5 – Creation Process & Collaborations

Team involved	Auschwitz-Birkenau State Museum Digital Department Google Arts & Culture Technical and educational collaborators (e.g., historians, archivists)
Main project phases	Planning and digital archiving (2015-2016) Development of 3D models and digital tours (2016-2017) Launch and user engagement (2017-present)
External collaborators	Google Arts & Culture Educational institutions Survivors of concentration camp and their memories Spacery360.pl; ai360.pl

CASE STUDY 7 - MADEIRA WHALE MUSEUM, PORTUGAL



1 – Project details

Virtual Museum Name	Madeira Whale Museum Virtual Experience
Institution / Organisation	Museu da Baleia da Madeira – MBM
Institution type	Archive
City & Country	Caniçal Machico – Madeira Portugal
Website (if any)	*https://www.museudabaleia.org/en/*
Primary contact for information	geral@museudabaleia.org

2 – Virtual Museum Overview

Short description	Since 2014, Dr. Horácio Bento de Gouveia School has collaborated with the Madeira Whale Museum (MBM) to develop artistic and digital projects focused on ocean sustainability and marine heritage. This partnership combines art, science, and technology to promote environmental education and awareness .Students create artworks inspired by whales and marine ecosystems, using digital tools such as Canva, Tinkercad, and Padlet to design and share their creations. These projects link museum content to real-world issues and encourage creative reflection on ocean preservation.By merging artistic expression with digital innovation, the initiative extends the museum experience beyond its walls, engaging the community through exhibitions and virtual platforms.
Platform used	Sketchfab Platform, MuseuMap Gallery
Creation / launch date	2015

Public link (URL)	https://ecohbg2.wordpress.com/

3 – Content & Themes

Main themes / collections	Art, Environmental Education, Ocean Sustainability, Whales and Marine Life
Content type	2-D images, 3-D models, Video, Audio, ext panels, Games/Quizzes, AR
Why is it unique / innovative?	The project bridges formal education and museum learning through creative use of technology. Students co-create digital artworks that reinterpret marine heritage and sustainability themes. It transforms the museum into an interactive learning laboratory, linking art, science, and citizenship through hybrid spaces—school, museum, and community.

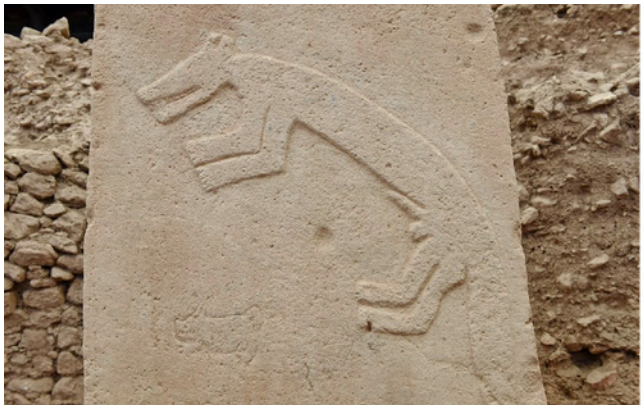
4 – Objectives & Impact

Educational / cultural goals	- Promote environmental awareness, creative expression and interdisciplinary learning. - Foster digital literacy, critical thinking, and citizenship aligned with SDG 14 – Life Below Water. - Strengthen collaboration between school, museum and local community.
Target audience	Students (age 10-13), General public, Families
Results & impact	Over 200 students involved across multiple school years. The initiative increased engagement with environmental issues, enhanced students' digital and artistic skills, and encouraged public dialogue on ocean sustainability through exhibitions and online sharing.

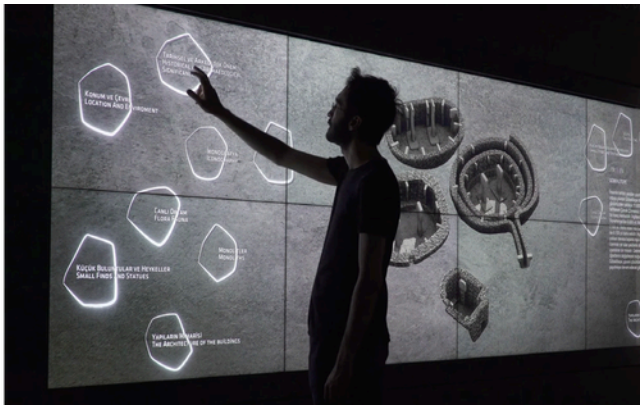
5 – Creation Process & Collaborations

Team involved	Art teachers, Science teachers, ICT coordinators, MBM museum educators
Main project phases	Research and concept development Artistic creation and digital design Museum collaboration and AR integration Public and virtual exhibition
External collaborators	Madeira Whale Museum (MBM) educational team, Municipality of Machico

CASE STUDY 8 - GÖBEKLITEPE VIRTUAL MUSEUM, TURKEY



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1 – Project details

Virtual Museum Name	Göbeklitepe Virtual Museum
Institution / Organisation	Abdülkerim Bengi Anatolian High School
Institution type	High School
City & Country	Tarsus, Turkey
Website (if any)	*https://abdulkerimbengi.meb.k12.tr*
Primary contact for information	Gülsüm Ünal Cüvelek – English Teacher / Project Coordinator Benetton6333@gmail.com

2 – Virtual Museum Overview

Short description	The Göbeklitepe Virtual Museum was created as part of the Museums Uniting Students and Educators in Digital and Historical Exploration (MUSED) Erasmus+ project. It introduces visitors to Göbeklitepe, one of the world's oldest known temples located in southeastern Turkey, dating back to around 9600 BC. The virtual museum allows users to explore digital reconstructions of archaeological sites, 3D models of stone pillars, and interactive educational content about Neolithic life and rituals. It aims to blend historical authenticity with innovative digital storytelling, making ancient heritage accessible to everyone. Students actively participated in designing the exhibition storyline, digital artifacts, and English–Turkish information panels, combining technology, art, and history.
Platform used	ThingLink and Artsteps (3D virtual environment tools)

Creation / launch date	June 2025
Public link (URL)	*https://www.artsteps.com/view/gobeklitepe-virtual-museum*

3 – Content & Themes

Main themes / collections	- Neolithic archaeology - Early human settlements and rituals - Cultural heritage of Şanlıurfa
Content type	2-D images, 3-D models, Video, Audio, Text panels, Games/Quizzes, 360° tour
Why is it unique / innovative?	It presents Göbeklitepe as a living, interactive space rather than a static exhibit. Through 3D exploration, immersive storytelling, and multilingual content, it connects ancient civilization with today's learners. The virtual museum democratizes cultural access, allowing students worldwide to "visit" a UNESCO site digitally.

4 – Objectives & Impact

Educational / cultural goals	- To promote awareness of Turkey's archaeological heritage. - To develop students' digital literacy and cultural communication skills. - To encourage international collaboration through Erasmus+ activities.
Target audience	Students (age 14–18), General public, Researchers, Families
Results & impact	Students improved historical understanding, language skills, and teamwork. The museum was showcased during Erasmus Days and received positive feedback from partner countries for its creativity and accessibility.

5 – Creation Process & Collaborations

Team involved	Abdülkerim Bengi Anatolian High School teachers and students (English, ICT, and History departments).
Main project phases	1. Research on Göbeklitepe and script creation. 2. Multimedia collection and 3D model preparation. 3. Virtual museum design and narration. 4. Erasmus Days public presentation.
External collaborators	MUSED project partners from Italy, Spain, Greece, Madeira (Portugal), Poland, and Hungary.

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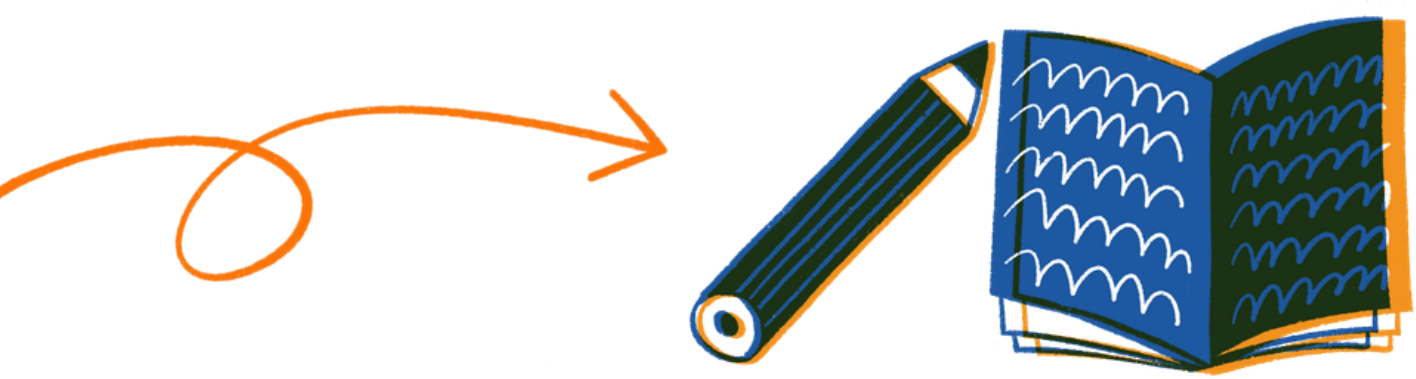
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MUSED partners

Insieme Per Camminare (Italy)
https://insiemepercamminare.com

Espacio Rojo (Spain)
www.espaciorojo.com

Liceo Carlo Troya (Italy)
https://www.liceotroya.edu.it

Hungarian National Museum (Hungary)
https://mnm.hu/hu

Model Vocational High School of Epanomi (Greece)
https://1epal-epanom.thess.sch.gr

Escola Básica Ciclos Dr. Horácio Bento de Gouveia (Portugal)
https://hbg.pt

Abdulkerim Bengi Anadolu Lisesi (Turkey)
https://akbal.meb.k12.tr/tema/

Collegium Balticum Akademia Nauk Stosowanych (Poland) https://www.cb.szczecin.pl

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