

Design of Itineraries and Scenarios

Deliverable D. 3.1

Deliverable information	
WP	3
Document dissemination level	PU - Public
Deliverable type	R – Document report
Lead beneficiary	CNR
Contributors	UT
Date	17.04.2026
Document status	First version
Document version	V.01
Due Date	30.04.2026



Funded by
the European Union

This project has received funding from HORIZON-CL2-2024-
HERITAGE-ECCCH-01-04, under Grant Agreement n. 101233325

Project Information

Project start date: 1st October 2025

Project Duration: 48 months

Project website: <https://placemus-xr-eccch.eu/>

Project Contacts

Project Coordinator: Eva Pietroni

CNR ISPC E-mail: eva.pietroni@cnr.it

WP3 Scientific coordinator: Eva Pietroni

Project Manager: Daniela Maria Palamà

CR ISPC e-mail: danielamaria.palama@cnr.it

Placemus XR Consortium

No.	Short name	Institution name	Country
1	CNR	Consiglio Nazionale delle Ricerche	Italy
2	CHANGES	Fondazione CHANGES - Cultural Heritage active Innovation for Sustainable Society	Italy
3	CNRS	Centre National de la Recherche Scientifique CNRS	France
4	UT	Université de Tours	France
5	MF	Mezzo Forte	France
6	OU	The Open University	UK
7	Hangvető	Hangveto Zenei Terjeszto Tarsulas korlatolt Fe- lelossegu Tarsasag	Hungary
8	GEOFolkLife	GEORGIA Folk Life	Georgia
9	3DR	3D Research Srl	Italy
10	SD	S.D. Cinematografica	Italy
11	PK/CUT	Politechnika Krakowska	Poland
12	COBO	Comune di Bologna	Italy
13	BCM-GIR	Ministero della Cultura	Italy
14	MdV	Museo del Violino	Italy

Executive Summary

This report presents the framework developed within PlaceMUS XR for designing immersive musical itineraries and scenarios. It tackles the challenge of representing music—an intangible, performative phenomenon—in heritage contexts, proposing sound as a primary medium for interpretation and experience.

Drawing on interdisciplinary research across musicology, archaeology, art history, sound studies, digital heritage, and interactive design, the report explores sonic immersion through reconstructed soundscapes, spatialised audio, and embodied engagement.

Particular attention is given to the role of gesture, perception, and collective experience in shaping encounters with musical heritage, as well as to issues of authenticity of experience, accessibility, and inclusivity. Insights from the 2026 CNR ISPC survey further inform understanding of users' expectations and engagement.

The methodology used to identify and design the musical itineraries brings together the selection of musical sites, the assessment of their significance, and the analysis of existing initiatives, leading to a diverse set of case studies. All itineraries are grouped into territorial, musical genre-based, and conceptual categories, and follow coherent storytelling, narrative strategies, and gamification elements.

The report defines a comprehensive set of requirements for the design of musical experiences, including criteria for spatial representation, integration of recordings, and interaction design. It details technologies such as 3D modelling, 360° media, photogrammetry, Gaussian splatting, and spatial audio techniques (including Spatial Room Impulse Responses—SRIR, and soundscape recording), alongside their implementation within the ECCCH (European Collaborative Cloud for Cultural Heritage) digital ecosystem. Interface design, user navigation, and the integration of GeoViz (see the Glossary at the end of the report), story maps, and augmented listening systems are essential to the itineraries' development.

The issue of data standardisation, sustainability, legal frameworks, and the maintenance of digital installations are also addressed to ensure cultural heritage resources' long-term viability and ethical management.

The project develops nine itineraries, each based on a case study across Europe. Together, they encompass diverse musical traditions, historical periods, and institutional contexts—from Renaissance courts and sacred architecture to contemporary and intangible practices.

Document History

Version	Release date	Summary of changes	Authors - Institution
V.01	17.04.2026	First version	C. Cavicchi*, E. Pietroni**, L. Tunesi*, M. Mathieu*, M. Quais *, M. Taloni** *UT, ** CNR
			Contributors J.-Y. Blaise (CNRS), Ph. Vendrix (UT), S. Men- conero (CNR), S. Holland (OU), V. Bartalesi (CNR), M. Liuni (MF)
V.02	28.04.2026	Final version	Reviewers J.-Y. Blaise (CNRS), E. Della Longa (CNR), Ph. Vendrix (UT), B. Pucci (Changes), S. Isabella (3DR), R. Aloisi (3DR), S. Holland (OU)

Contents

Project Information	1
Project Contacts	1
Placemus XR Consortium.....	1
Executive Summary	2
Document History.....	3
Introduction.....	7
Purpose of WP3 and Deliverable 3.1 (OBJ-03)	8
Section I: Objectives & Methodology	12
I.1 Objective of Itineraries and XR Scenarios Design	12
I.2 Methodological Framework and Scientific Background	12
I.2.1 The Epistemological Challenge of Exhibiting Music in Museum Spaces	13
I.2.2 Sound as an Interpretative and Immersive Medium in Museums.....	14
I.2.3 Immersive Technologies, Reconstructed Landscapes, and the Conditions of Sonic Immersion.....	16
I.2.4 Embodiment, Gesture, and the Specificity of Music Museums.....	18
I.2.5 Collective Presence, Authenticity of the Experience, and Accessibility in Immersive Cultural Experiences.....	18
I.2.6 Historically Informed Virtual Reconstructions	23
I.2.7 Audience Expectations and the 2026 CNR ISPC Survey.....	25
I.3 Methodology to Identify and Design Scenarios and Itineraries.....	25
I.3.1 Identification of Places of Music	28
I.3.2 Musical Significance.....	29
I.3.3 Initial Analysis of Previous and Current Initiatives	30
I.3.4 What is New in PlaceMUS XR in Relation to Musical Itineraries Design.....	32
I.3.5 Case Studies Overview.....	33
I.3.6 Verifiability and Measurability Based on Key Performance Indicators (KPI)..	37
I.4 Integration of Feedback from the Preliminary Survey	39
I.4.1 Objectives	39
I.4.2 Translation of User Research into Design Requirements	41
I.4.3 The Surveys' Current Status.....	41
Section II: Requirements and Criteria to Design Scenarios and Itineraries	43
II.1 Designing Experiences for Places of Music	43
II.2 Itineraries Design	44
II.2.1 Types of Itineraries.....	44
II.2.2 Storytelling Strategy in PlaceMUS XR.....	46

D 3.1

Design of Itineraries and Scenarios

II.2.3 Narrative Connection between Places	47
II.2.4 Gamification	47
II.2.5 Embodiment and Authenticity of the Experience	48
II.2.6 Intersections and Semi-Automatic Generation of New Itineraries	49
II.3 Scales of Representation of Musical Itineraries and Places.....	49
II.4 Sound Design, Acoustic Measurements and Spatialised Sound Reproduction in VR Experiences	51
II.5 Integration of Musical Recordings.....	52
II.6 Digitisation, 3D Representation, and Interaction Paradigms	52
II.6.1 360° Panorama	53
II.6.2 360° Panorama with Depth Map.....	53
II.6.3 Detailed 3D Model Derived from Spatial and Acoustic Acquisition	54
II.6.4 Gaussian Splatting (3DGS)	54
II.6.5 360° Video.....	55
II.6.6 3D Objects from Photogrammetry	56
II.6.7 Spatial Room Impulse Responses (SRIR).....	56
II.6.8 Recorded Soundscape	57
II.6.9 Multidimensional Icons and Earcons.....	57
II.7 Integration of Musical Itineraries into ECCCH.....	57
II.8 Itinerary Interface	61
II.8.1 Introductory 3D Space.....	61
II.8.2 Itinerary Overview	61
II.8.3 Journey Through the Itinerary.....	64
II.8.4 Places of Music.....	66
II.9 Dataset Standardisation.....	71
II.10 Guidelines for Musical Installations Maintenance	72
II.10.1 Sustainability and Maintenance of Digital Tools and Applications in Cultural Venues	73
II.10.2 EU Legislation.....	75
II.10.3 Moral Rights	76
II.10.4 Regulations Governing the Protection of Musical Cultural Heritage: Some Italian Examples	78
II.11 What to Do to Design Scenarios and Itineraries - Check-list	80
SECTION III: Case Studies	83
III.1 Music in Renaissance Loire Valley.....	84
III.2 Music in Renaissance Ferrara	88
III.3 A Madrigal Journey Through Renaissance Italy	92

D 3.1

Design of Itineraries and Scenarios

III.4 Organs, Sacred Architecture, and Urban Soundscapes in Krakow.....	95
III.5 Listening to the Past in Bologna’s Museo della musica.....	99
III.6 From Wood to Sound: The Northern Italian Art of Violin Making to Sound	103
III.7 Music in Budapest: From Liszt to the Táncház	106
III.8 A Journey Through Georgian Polyphonic Traditions.....	109
III.9 Exploring the Evolution of Harmony in Popular Music in UK.....	112
Conclusions	115
Glossary	117
Annex 1 Information Architecture	120

NOTICE

In the following text, the words highlighted in bold and purple are explained in the Glossary, at the end of the document.

Introduction

The PlaceMUS XR project focuses on developing cutting-edge digital tools to be integrated into the **European Collaborative Cloud for Cultural Heritage (ECCCH)**, with the aim of enriching the visitor experience through engagement with cultural contexts and **heritage objects**. Design and simulation tools will be implemented to: 1) create, share, and reuse interactive content; and 2) analyse, design, and evaluate visitors' interactions. These tools are intended to benefit museum curators, creative professionals, students, and researchers.

The leading theme of the project is called "Itinerary and Places of Music in Europe." It encompasses various types of material objects and contexts as well as **intangible heritage**, whose value and understanding are enhanced by virtual reality technologies and digital, interactive tools.

Music is not only the art of time; it is also an art of space. When performed in a particular space, the environment shapes how music is experienced, influencing both its emotional impact and its cultural significance.

The project will use digital, virtual, and augmented reality tools to contextualise several musical forms within geographical, social, historical, and cultural contexts. This process will be conducted through: 1) experiencing audio-visual recordings of live performances, or coming from existing discography, of the musical repertoires selected for the itineraries; 2) reconstructing musical events narrated in official chronicles; 3) examining travelogs along with musicians' and patrons' diaries and letters; 4) examining significant passages from philosophical treatises addressing music and its relationship with other arts; 5) examining dances or ceremonies in their original or significant settings, using historical and contemporary recordings; and 6) observing the surviving traces of a city's musical heritage that remain visible in the present day.

The project's overarching goal is to deepen appreciation of Europe's musical heritage by exploring how music relates to the spaces in which it is performed and their historical, cultural, and artistic contexts. This will be achieved by engaging users at a cognitive, aesthetic, and emotional level through Virtual and Augmented Reality and multimedia content. These virtual experiences will be accessible both remotely (digital experience) and on-site along visitors' itineraries (**phygital** experience).

The Horizon Europe calls for proposals have increasingly emphasised the need for ease of access and usability for less well-equipped users, including online accessibility under conditions of limited connectivity. In response, PlaceMUS XR will develop solutions capable of delivering rich, emotional, and **embodied** experiences through scalable and adaptable tools designed for diverse audiences and varying contexts of use.

Design of Itineraries and Scenarios

Digital experiences will be accessible through a range of open-source platforms and tools, designed for different usage contexts and based on on-demand access. These tools will support: 1) scenarios creation; 2) scenario visualisation; and 3) multisensory interaction with musical places. They will be integrated into the ECCCH (sharing the same knowledge base and adopting the Heritage Digital Twin Ontology) and will be accessible online from anywhere—at schools, at home, or along urban visiting routes. Access will be available across a range of devices, from personal smartphones and tablets to desktop systems and high-performance immersive hardware, without requiring any installation, enabling multisensory experiences.

Datasets and tools will also be reusable in museum installations (such as holographic showcases, video projections, and immersive kiosks), where content can either be accessed online or downloaded from the ECCCH in case of low-connectivity environments.

In doing so, the project will provide a coherent framework to support the entire production pipeline, which operates across multiple levels of representation. Currently, no comparable integrated tools exist that bring together such a wide range of content and technologies, especially for a broad and diverse audience. Even though some components build on pre-existing research, they will be further developed and enhanced with new functionalities.

As such, PlaceMUS XR confronts Cultural Heritage professionals with the challenge of moving beyond a traditional “one-to-many” model toward a dynamic, participatory, and sustainable approach that emphasises accessibility, sharing, reusability, and co-creation.

Purpose of WP3 and Deliverable 3.1 (OBJ-03)

WP3 is devoted to the design and development of itineraries and scenarios across Europe. These itineraries will actively involve all Consortium countries—France, Georgia, Italy, Hungary, Poland, and the United Kingdom. In doing so, they will foster a transnational and comparative perspective.

Representative itineraries will be strategically identified as testbeds for validating the methodologies and tools developed within the project. Rather than serving simply as illustrative case studies, these itineraries will act as experimental frameworks allowing theoretical assumptions and technological solutions to be critically assessed against real-world conditions. This approach is grounded in a systematic analysis of existing similar initiatives, whose strengths and limitations will inform the design process. At the same time, particular attention will be paid to the expectations and needs of internal stakeholders and end users (WP5), ensuring that the proposed solutions are both relevant and user-centred.

D 3.1

Design of Itineraries and Scenarios

On this basis, a set of key variables and conceptual parameters have been defined to guide the design of itineraries and scenarios, covering spatial, historical, and experiential dimensions, as well as modes of interaction and interpretation, with the aim of enhancing cultural understanding, accessibility, and engagement (OBJ-03). As such, these itineraries are conceived not simply as routes, but as structured narratives that articulate places, practices, and meanings across time and space.

The planning of cultural routes will therefore be accompanied by the systematic collection, selection, and curation of heterogeneous resources, spanning archival documents, textual and audiovisual sources, and data derived from the project's research activities. Through this process, the proposed scenarios will achieve both methodological rigor and rich experiential value. Furthermore, collaboration with local institutions will play a crucial role in reinforcing the project's networking capacity and territorial anchoring. Such partnerships will not only facilitate access to resources and expertise but also contribute to the co-creation of content and the long-term sustainability of the itineraries. As such, the project seeks to engage a broad ecosystem of cultural stakeholders, creating synergies between research, heritage institutions, and local communities.

WP3 features two tasks:

- Task 3.1 “Requirements and Criteria” is devoted to the design of scenarios and itineraries. Led by the University of Tours, it involves all Consortium partners and runs from M2 to M7 (Novembre 2025-April 2026). The goal is to define and share cultural and technical requirements, dataset standardization, information architecture, and editorial guidelines for content creation. Under Task 3.1, existing similar initiatives will be reviewed to assess how feasible the proposed scenarios and itineraries are;
- Task 3.2 “Design of case studies and collection of existing resources” [M6-17]. Led by CNR, with the contributions of all the consortium partners, the task features the creation of working groups for each case studies. These working groups will focus on case studies' co-creation and detailed design in terms of themes, itineraries, musical repertoires and related context. Existing resources will be collected from archives and available discography (R 03.3). Venues for live music recordings will be identified. Finally, Task 3.2 will also draft user and technological solutions.

Design of Itineraries and Scenarios

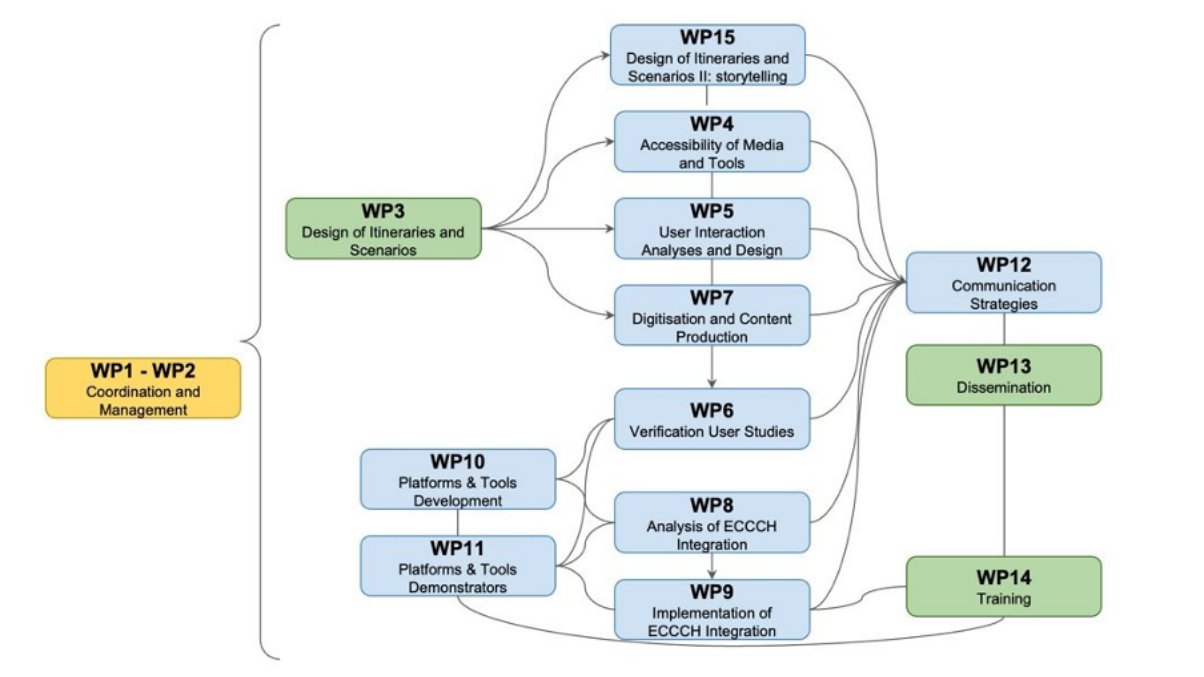


Figure 1. WP3 and how it connects with the other WPs.

WP3 plays a central and structuring role within the project, functioning as the central nexus for integrating research, technological development, and user-oriented activities. It is within WP3 that the project’s core ambition—namely, the creation of meaningful, historically accurate, as well as innovative and technology-driven cultural itineraries—is articulated and implemented.

WP3 builds on the framework established by WP1 and WP2, which provide managerial, organisational, and strategic support, and connects closely to WP5 (User Interaction Analyses and Design) to incorporate insights on users’ needs, behaviours, and expectations. These inputs are critical in shaping the itineraries’ experiential and interactive design. They will provide outputs that are not only conceptually robust but also accessible, engaging, and inclusive. This user-centred perspective is further reinforced through WP6 (Verification User Studies), which provides iterative feedback loops, allowing WP3’s outputs to be tested, evaluated, and progressively refined.

Simultaneously, WP3 builds on WP7 (Digitisation and Content Production), which supplies the multimedia and documentary resources necessary for constructing the scenarios. WP3 and WP7 benefit from each other: while WP7 provides the raw and processed content, WP3 sets the narrative and contextual frameworks that shape how this content is understood.

D 3.1**Design of Itineraries and Scenarios**

WP3 is also closely linked to WP4 (Accessibility of Media and Tools), ensuring that itineraries are compatible with technological and accessibility requirements, including conditions of limited connectivity. To this end, WP3 balances ambition and feasibility by aligning experiential richness with practical usability.

Furthermore, WP3 contributes to higher-level narrative and interpretative layers through its interaction with WP15 (Design of Itineraries and Scenarios II: Storytelling), in which the developed scenarios are enriched through advanced storytelling strategies that enhance their communicative impact.

On the technological side, WP3 connects closely with WP10 and WP11 (Platforms and Tools Development and Demonstrators). The itineraries and scenarios foster the development of platforms that will be subsequently implemented and tested through demonstrators. This connection ensures that technological solutions are grounded in real cultural and experiential needs.

At the same time, as addressed in WP8 (Analysis of ECCCH Integration) and WP9 (Implementation of ECCCH Integration), WP3 contributes to and benefits from the integration processes of integration within the broader ECCCH. As such, the scenarios designed in WP3 become key entry points for structuring, testing, and validating the integration of data, tools, and services within this shared infrastructure.

Moreover, WP3 plays a significant role in public-facing activities. Its outputs feed directly into WP12 (Communication Strategies) and WP13 (Dissemination), providing concrete, narrative-rich materials that enhance the project's visibility and societal impact. Finally, WP3 contributes to WP14 (Training) by drawing on the itineraries developed within this task and by providing pedagogical and capacity-building resources tailored to diverse audiences.

All in all, WP3 functions as the central hub of the project's ecosystem, generating the interplay between content production, user engagement, technological development, and dissemination. By translating data, tools, and user insights into structured and meaningful experiences, it ensures both the achievement of the project's goals and its outcomes' applicability across multiple contexts.

Section I: Objectives & Methodology

I.1 Objective of Itineraries and XR Scenarios Design

WP3 aims to demonstrate the workability of the tools and methodologies advanced by PlaceMUS XR through a series of representative case studies. Along with serving as testbeds for the project's tools, these case studies will also provide a practical way to apply the solutions being developed. They are designed to cover a broad range of Cultural Heritage (CH) objects and materials. They address Cultural Heritage's both tangible and intangible features, including movable artefacts, architecture, historical documents, inscriptions, and performance practices.

A central objective of WP3 is to articulate the relationships between music, sound, and their broader cultural contexts. This includes music's and sound's connections with places, visual arts, museum collections, historical figures, landscapes, social behaviours, and forms of self-representation. In doing so, WP3 aims to highlight how sonic heritage is deeply integrated into complex cultural ecosystems. Particular attention is given to representing the diversity of European sonic heritage, encompassing a wide range of musical genres performance practices, audiences, traditions, and environments. This diversity is essential to ensure that the proposed itineraries are both inclusive and culturally representative.

As such, WP3 focuses on the design of itineraries that engage users as active participants: travellers embarking on a multisensory, educational, and emotionally resonant journey that will allow them to move through space, time, and sounds.

Ultimately, WP3 aims to help citizens and tourists explore new cultural routes across Europe, or revisit familiar ones from the perspective of their lesser-known musical history, thus highlighting the richness and diversity of Europe's musical heritage and offering a renewed understanding of its cultural landscapes through sound.

I.2 Methodological Framework and Scientific Background

The present section is organised into six interrelated parts that progressively frame the theoretical, methodological, and empirical foundations of sound-based mediation in museum environments. It first addresses the epistemological challenge of exhibiting music in museum spaces, focusing on the intrinsic difficulty of presenting music as an intangible, temporal, and performative form of heritage within traditionally object-centred museographic settings. The second part examines sound as an interpretative and immersive medium in museums, highlighting its role in knowledge transmission, emotional engagement, and the recontextualization of objects through multisensory mediation.

Design of Itineraries and Scenarios

Building on this conceptual framework, the third part explores immersive technologies, reconstructed soundscapes, and the conditions of sonic immersion, with particular attention to audio augmented reality, spatial sound design, and the perceptual factors that support presence, realism, and visitor engagement. The fourth part focuses on embodiment, gesture, and the specificity of music museums and emphasises the importance of performative knowledge, bodily interaction, and the transmission of tacit skills associated with musical instruments and sound-making practices.

The fifth section broadens the discussion to include collective experience, authenticity of the experience, and accessibility, addressing the social, inclusive, and user-centred dimensions of sound mediation and how it can support diverse audiences and foster shared cultural experiences. The section ends by showing the results of the 2026 CNR ISPC survey, which provide an initial empirical basis for assessing public perceptions of sound in museum contexts and inform the methodological development of the PlaceMUS XR framework with data provided directly by users.

1.2.1 The Epistemological Challenge of Exhibiting Music in Museum Spaces

Recent museological studies highlight a growing shift toward the integration of immersive musical installations within museum environments, particularly through Virtual Reality (VR), Augmented Reality (AR), and spatialised soundscapes. These approaches respond to a longstanding epistemological challenge: the difficulty of exhibiting music as an inherently intangible and performative phenomenon. Unlike visual artefacts, music cannot be fully understood through display alone, as its meaning emerges through sound, gesture, temporality, and embodied performance.

Sound is a powerful medium for representing and transmitting knowledge, and for engaging experience on both unconscious and rational levels. As such, it plays a central role in forming and developing individual and collective cultural identity.¹

According to Murray Schafer, the sound environment is the result of the interaction between sound, space, and time.² Sound, however, is also intrinsically tied to physical spaces, cultural contexts, human bodies, mind, and emotion.³

This epistemological challenge calls for a reconsideration of the role of sound within museum environments, not merely as a supplementary element but as a central interpretative and experiential medium capable of connecting objects with their sonic, cultural, and performative dimensions.

¹ E. Pietroni, "Multisensory Museums, Hybrid Realities, Narration, and Technological Innovation: A Discussion Around New Perspectives in Experience Design and Sense of Authenticity" *Heritage* 8, 2025, 130. <https://doi.org/10.3390/heritage8040130>

² R.M. Schafer, *The Tuning of the World*, New York: Random House Inc., 1977.

³ H.B. Firat, "Acoustics as Tangible Heritage: Re-embodiment of the Sensory Heritage in the Boundless Reign of Sight" *Preservation Digital Technology & Culture* 50, 2021, 3–14. <https://doi.org/10.1515/pdte-2020-0028>

1.2.2 Sound as an Interpretative and Immersive Medium in Museums

In museums, sound plays a key role in enhancing visitors' cognitive and emotional engagement. Soundscapes can evoke the cultural identity and lived context of museum objects, lending acoustic realism to simulated spaces. They do so by conveying meaningful sounds—such as music, timbres, harmonies, and vocal techniques—drawn from traditional instruments and songs and rooted in the places where they were/are practiced.

A highly relevant theoretical framework for understanding the role of sound in museum contexts is proposed by Alcina Cortez, who identifies a shift from museums that are predominantly visually oriented toward multisensory and participatory environments. Historically, museums were conceived as what may be described as “mechanisms of vision,” prioritizing silence to reinforce visual attention and intellectual control over displayed objects. In this perspective, knowledge was assumed to reside primarily in material artefacts and visual signs, while sound was often perceived as secondary or even distracting.

Starting in the 1980s, the development of new media technologies, together with advances in neuroscience demonstrating that human perception is inherently multisensory, has progressively transformed museums into what Cortez describes as “sensory gymnasiums.” This shift reflects a move from a predominantly visual toward an oral and aural epistemology, in which knowledge is no longer understood as solely object-based, but also as experiential, relational, and immersive.

Within this framework, Cortez identifies five principal modes of sound used in museums:

- first, sound as lecturing represents the most traditional use. This includes both silence as a pedagogical strategy—designed to maximise visual concentration—and the use of sound as a substitute for oral explanation through phonographs, audio guides, and spoken commentary;
- second, sound as artefact considers sound itself as an object of heritage and interpretation, particularly in relation to musical traditions, popular culture, acoustic phenomena, and historical soundscapes;
- third, sound as ambiance emphasises the affective and spatial dimensions of sound, using it to shape the gallery environment and stimulate embodied responses rather than purely intellectual ones;
- fourth, sound as art refers to sound installations conceived as artistic experiences, aimed at sensory stimulation, visitor participation, and the creation of a sense of collectiveness;
- fifth, sound as collaborative curation includes digital and participatory practices through which visitors actively contribute to the production of content

D 3.1

Design of Itineraries and Scenarios

(e.g., through playlists, shared sound maps, or archives of audio documents), thereby transforming the museum into a space of shared cultural production.

As such, sound in museum contexts can no longer be considered as a secondary informational tool; rather, it constitutes a complex curatorial material capable of redefining visitor experience through immersion, interpretation, and collaboration.⁴

In another recent article, Foteini Salmouka and Andromache Gazi examine sound as an interpretative medium in museum exhibitions, arguing that it has both cognitive and affective effects by enhancing understanding while shaping emotion, attention, and the pace of the visit. They propose a framework in which sound fulfils three roles—informative, interpretative, and immersive—demonstrating how audio can convey information, deepen conceptual understanding, and create atmosphere. Through practices such as object narration, sonic references, and historically informed recordings, sound helps reconnect museum objects with their social, cultural, and historical ground, while immersive soundscapes can place visitors within reconstructed environments for a more embodied and memorable experience. Although concerns about visitor getting distracted by sonic elements remain, the authors stress that when sound is integrated from the early stages of the exhibition's design, it strengthens interpretation and fosters a more personal and engaging relationship between visitors and exhibits.⁵

A further critical perspective on the role of sound in museums is offered by Emily Candela and Eric de Visscher, whose work examines sound design as a tool for the reinterpretation of museum narratives. The authors argue that the Western museum has traditionally relied on a visual, silent, and object-centred approach, a model that often tends to erase the sensory, social, and political dimensions of their histories.

Through the educational project “The Sounding Object,” developed in collaboration with the Victoria and Albert Museum, the authors explore how sound can reveal alternative, polyphonic, and embodied narratives. Several student installations use sound to evoke bodily experiences, forgotten memories, and marginalised stories, particularly those linked to gender, labour, and cultural appropriation. In this perspective, sound becomes not only an interpretative medium but also a critical curatorial tool transforming the relationship between the visitor and the object. Rather than reinforcing a single authoritative narrative, sound design enables the museum

⁴ A. Cortez, “Museums as sites for displaying sound materials: a five-use Framework” *Sound Studies*, 2021, 43–72. <https://doi.org/10.1080/20551940.2021.1975442>

⁵ F. Salmouka and A. Gazi, “Mapping Sonic Practices in Museum Exhibitions – An Overview in Emerging technologies and the digital transformation of museums and heritage sites: first international conference”. In *Emerging Technologies and the Digital Transformation of Museums and Heritage Sites*, edited by M. Shehade and T. Stylianou-Lambert, New York: Springer Publishing, 2021, 61–75. https://doi.org/10.1007/978-3-030-83647-4_5

Design of Itineraries and Scenarios

to be conceived as a space of dialogue, a plurality of voices, and an active questioning of dominant narratives.⁶

This critical and plural understanding of sonic mediation is further expanded by recent immersive technologies, which allow to translate these alternative narratives into spatialised and embodied experiences.

1.2.3 Immersive Technologies, Reconstructed Landscapes, and the Conditions of Sonic Immersion

In terms of promotion and valorisation, immersive sound installations allow museums to reconnect objects, spaces, and historical practices to reactivate intangible heritage through contextualised auditory experiences. Studies on audio-augmented reality and soundscape design show that congruent sonic environments foster exploration, reduce distraction, and deepen interpretative engagement.⁷

Contemporary research demonstrates that immersive technologies enhance the sense of presence, emotional engagement, and cognitive involvement of visitors, thereby significantly improving both learning outcomes and visitor satisfaction.⁸

More specifically, immersive sound-based technologies may rely on psycho-acoustic principles (the same ones we see, for instance, in video games or movies), or on scientific simulations of acoustic spaces generated through mathematical models.⁹

Various disciplines—including archaeology, art history, anthropology, musicology, architecture, acoustemology, ethnomusicology, and archaeoacoustics—intersect in the study of past soundscapes. This interdisciplinary approach is reflected in the studies published in 2020 in the special issue of *Acoustics*, “Historical Acoustics: Relationships between People and Sound over Time.”¹⁰

A particularly relevant contribution to this field is the study by Valentin Bauer, which investigates the technical and psychological factors that foster sonic immersion in augmented reality (AR) environments. Unlike Virtual Reality, which isolates the user from the physical world, audio augmented reality must integrate virtual sounds coherently within the existing acoustic environment. Bauer identifies three key factors

⁶ E. Candela and E. de Visscher, “Learning from “The Sounding Object”: Sound Design in the Critical Reimagining of Museum Object Narratives” *DesignIssues* 39(2), 2023, 57-71. https://doi.org/10.1162/desi_a_00717

⁷ M.J. Bem *et al.*, “Enhancing museum experiences: Using immersive environments to evaluate soundscape preferences” *The Journal of the Acoustical Society of America* 157(2), 2025, 1097-1108. <https://doi.org/10.1121/10.0035832>

⁸ S. Chang and J. Suh, “The Impact of Digital Storytelling on Presence, Immersion, Enjoyment, and Continued Usage Intention in VR-Based Museum Exhibitions” *Sensors* 25(9), 2025, 2914. <https://doi.org/10.3390/s25092914>

⁹ E. Pietroni, “Mapping the Soundscape in Communicative Forms for Cultural Heritage: Between Realism and Symbolism” *Heritage* 4, 2021, 4495-4523. <https://doi.org/10.3390/heritage4040248>

¹⁰ F. Aletta and J. Kang, “Historical Acoustics: Relationships between People and Sound over Time” *Acoustics* 2(1), 2020, 128-130. <https://doi.org/10.3390/acoustics2010009>

Design of Itineraries and Scenarios

that determine whether users experience immersion in an augmented sonic environment:

- first, realism, understood as the quality of audio rendering, is essential. Virtual sounds must appear credible and spatially plausible. This requires binaural technologies capable of reproducing human three-dimensional auditory perception, as well as the integration of the acoustic properties of the real environment so that virtual sounds do not appear artificially superimposed onto reality;
- second, agency plays a central role in reinforcing immersion. The user must be able to influence the sonic environment, with sounds reacting in real time to head movements through tracking sensors and, more broadly, to the user's actions and position in space;
- third, representational coherence concerns the relationship between what users hear and what they cognitively expect to hear. Immersion is facilitated when the sound corresponds to visible objects, spatial cues, or a logically coherent narrative context.

Bauer further distinguishes between two concepts that are often conflated:

- immersion refers to the objective technological qualities of the system, such as headset performance, spatial audio fidelity, and motion-tracking precision;
- presence, by contrast, refers to the subjective feeling of “being there.” A system may therefore be technically immersive while failing to generate presence if the narrative, contextual, or perceptual framework remains weak.

The study also underlines that audio augmented reality is more complex than virtual reality because it must manage a condition of dual presence: the user simultaneously inhabits the physical world—where ambient sounds remain perceptible—and the virtual sonic layer. The main challenge is to avoid cognitive conflict. If virtual sounds do not precisely follow head movements or fail to align with spatial expectations, the brain immediately detects the discrepancy, and immersion is disrupted—exactly as it happens for the visual experience in Augmented Reality environments.

These findings are particularly relevant for the development of new forms of cultural mediation, live performance, and outdoor heritage experiences. The goal is to achieve a form of technological transparency, in which users forget the mediation device and remain fully engaged with the sonic experience itself.

Design of Itineraries and Scenarios

Ultimately, Bauer's study demonstrates that successful audio augmented reality experiences cannot rely on high-fidelity sound alone; rather, they require a synergy between technical realism, interactive responsiveness, and narrative coherence.¹¹

While these technological approaches provide new possibilities for sonic immersion, their relevance becomes especially significant in the specific context of music museums, where sound cannot be separated from gesture, bodily knowledge, and performative practice.

1.2.4 Embodiment, Gesture, and the Specificity of Music Museums

Music museums are a particularly interesting case, as musical instruments are not just objects to contemplate, but above all, to listen. Understanding them requires demonstrating how they work— their timbre, and the gestures required to play them.

In this context, the human body and the body of the instrument merge, becoming one large resonant organ. In a music museum, the aesthetic and cognitive experience should convey the fusion of object, sound, and gesture—expressing the feeling and emotion of the performer who brings the instrument and music to life.

This experience fosters a sense of embodiment and intimate participation. For this reason, PlaceMUS XR aims to develop an Atlas of Gestures (planned in WP7 T7.7) as a key component for preserving and transmitting performative knowledge and emotional responses.

Beyond individual embodiment, the museum experience must also be considered in its collective, social, and inclusive dimensions. These considerations raise important questions regarding accessibility, shared perception, and the design of visitor-centred mediation tools.

1.2.5 Collective Presence, Authenticity of the Experience, and Accessibility in Immersive Cultural Experiences

The design of the cultural itineraries is grounded in the notion of presence, understood through embodied experience. A key concept for the itineraries' design is the sense of presence, which relates to the cognitive and emotional involvement of the user in the surrounding environment. "Sensing" and "feeling embodied" in a cultural context involves the ability to connect with elements that affect us emotionally. The embodied cognition approach posits that mind and body are interconnected, a perspective that has gained prominence since the late twentieth century for emphasising the role of the body in shaping mental processes and language. Building on this, the extended mind theory suggests that cognition is also shaped by the

¹¹ V. Bauer, "Influence du réalisme, de l'agentivité et des représentations sur l'immersion sonore en réalité augmentée" *Cahiers Louis-Lumière* 15, 2022, 48-69. <https://www.ens-louis-lumiere.fr/wp-content/uploads/2023/11/Cahier-LL15.pdf>

Design of Itineraries and Scenarios

external environment and social interactions. This interplay becomes especially evident in virtual environments, where knowledge emerges through sensory-motor experience and interpretation. In such contexts, embodiment is strengthened through immersion, multisensory stimulation, emotional engagement, interactivity, realistic feedback, storytelling, soundscapes, and social interaction, all of which enhance cognitive engagement and user satisfaction.

Building on the concept of presence, recent scholarship in the social sciences, Digital Cultural Heritage, and psychology has given growing attention to authenticity, reframing it as a visitor-centred, multidimensional experience.¹² As these studies prove, the focus has progressively shifted from the authenticity of the artefact itself toward the authenticity of the visitor's lived experience.

Recent initiatives such as the PERCEIVE European project (Perceptive Enhanced Realities of Coloured Collections through AI and Virtual Experiences¹³) has shifted the focus from the artefacts to the visitors' experience. As the project shows, the idea of authenticity encompasses various dimensions:

- 1) the Self, or individual dimension: something unfamiliar becomes familiar and touches our deepest emotions, memories, and ideas. It is related to Self-perception, identity;
- 2) the Others, or social dimension: communication and interpersonal interactions (both in person and remotely) that fosters a sense of belonging to a community and the sharing of ideas;
- 3) the World, or environmental dimension: the space in which the self is situated (e.g., museums, cyberspace).

¹² M. Hassenzahl, "User Experience and Experience Design". In *Encyclopedia of Human-Computer Interaction*, edited by M. Soegaard and R.F. Dam, Aarhus: The Interaction Design Foundation, 2011. <https://ixdf.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/user-experience-and-experience-design>;

G.R. Carroll, "Authenticity: Attribution, Value and Meaning." In *Emerging Trends in the Social Sciences*, edited by R.A. Scott, S.M. Kosslyn, Hoboken-New Jersey: Wiley, 2015. <https://doi.org/10.13140/2.1.4697.6807>;

H. Persson et al., "Universal design, inclusive design, accessible design, design for all: Different concepts—One goal? On the concept of accessibility—Historical, methodological and philosophical aspects" *Universal Access in the Information Society* 14, 2015, 505–526. <https://doi.org/10.1007/s10209-014-0358-z>;

E. Pietroni and D. Ferdani, "Virtual Restoration and Virtual reconstruction in Cultural Heritage: Terminology, methodologies, visual representation techniques and cognitive models" *Information* 12, 2021, 167. <https://doi.org/10.3390/info12040167>;

S. Pescarin, G. Città and S. Spotti, "Authenticity in Interactive Experiences" *Heritage* 7, 2024, 6213–6242. <https://doi.org/10.3390/heritage7110292>;

E. Pietroni, *op. cit.*, 2025.

¹³ PERCEIVE Project—Perceptive Enhanced Realities of Coloured Collections through AI and Virtual Experiences. Available online: <https://perceive-horizon.eu/> (accessed on 17 April 2026).

Design of Itineraries and Scenarios

The sense of authenticity emerges when distant, impersonal elements become personally meaningful, that is, when they stir our emotions and evoke memories.¹⁴

Within this experiential framework, multisensory and sonic mediation emerge as key mechanisms through which presence and authenticity are reinforced.

The human experience is rooted in perception and emotion, which are essential for knowledge and personal development. Feeling embodied in a cultural context means connecting the Self with elements, such as evocative landscapes or multisensory experiences.¹⁵

Within this framework, sound and acoustic design in museums can also enhance a sense of authenticity by strengthening the collective dimension of the experience. It can foster perceptual and emotional synchronisation among visitors—a shared resonance that promotes cohesion and a sense of common meaning.¹⁶

Beyond experiential engagement, these developments also raise important ethical and design-related questions concerning accessibility and inclusion. Immersive technologies are increasingly conceived as mediation tools aimed at accessibility, inclusivity, and the democratization of complex cultural content, supporting diverse audiences—including non-specialists and sensory-impaired visitors.

Recent field-based research on museum accessibility and inclusion further reinforces the relevance of multisensory and sound-based approaches. This study aims to define design guidelines for creating museum experiences that are accessible to all visitors, including those with sensory, motor, or cognitive impairments.

Brischetto *et al.* adopt a Human-Centred Design (HCD) and Design for Inclusion approach, emphasizing that accessibility must be integrated from the earliest stages of the creative and curatorial process. Their methodology combines an analysis of the state of the art in assistive technologies, direct observation of visitors' behaviour in museum spaces, case-study analysis, and the identification of physical, sensory, and cognitive barriers that may limit visitor autonomy.

¹⁴ G.R. Adams and S.K. Marshall, "A developmental social psychology of identity: understanding the person-in-context" *Journal of Adolescence* 19(5), 1996, 429–442.

<https://doi.org/10.1006/jado.1996.0041>;

P. Vannini, A. Franzese, "The Authenticity of Self: Conceptualization, Personal Experience, and Practice" *Sociology Compass* 2, 2008, 1621–1637. <https://doi.org/10.1111/j.1751-9020.2008.00151.x>;

J.A. Wilt et al., "Authenticity, presence of meaning, and struggle with ultimate meaning: Nuanced between-and within-person associations" *Journal of Research in Personality* 93, 2021, 104104. <https://doi.org/10.1016/j.jrp.2021.104104>;

E.R. Bailey and S.S. Iyengar, "Positive—More than unbiased—Self-perceptions increase subjective authenticity" *Journal of Personality and Social Psychology* 125(6), 2023, 1351–1372. <https://doi.org/10.1037/pspa0000359>;

¹⁵ M. Forte, "About virtual archaeology: Disorders, cognitive interactions and virtuality". In *Virtual Reality in Archaeology* (BAR International Series S843), Oxford: Archaeopress, 2000, 247–259.

¹⁶ S. Feld, "Acustemologia". In *Gli Spazi Sonori Della Musica*, Palermo: L'Epos, 2010, 33–44.

Design of Itineraries and Scenarios

One of the main findings is the central role of multisensory design, a concept that also underpins the principles of universal design (UD). The study shows that inclusive museums cannot rely solely on visual mediation but should instead offer pathways that integrate touch (e.g., through three-dimensional reproductions), hearing (through enhanced audio guides and sound environments), and adaptive digital interfaces.

A second key dimension concerns the role of technology as an accessibility enabler. Solutions such as augmented reality, beacon-based navigation systems, and personalised mobile applications are identified as major tools for enhancing visitors' autonomy and orientation within museum spaces.

The study adopts a broader understanding of inclusion, extending beyond access to artworks themselves to encompass the entire visitor journey, from pre-visit preparation to orientation, interpretation, services, and exit pathways. As such, accessibility becomes a matter of overall user experience.

A further essential principle is the flexibility of information formats. To address the diversity of audiences, information should be available in multiple forms, including easy-to-read formats, braille, sign language, audio content, and adaptive interfaces, thereby allowing each visitor to choose the most suitable mode of reception.

The study ultimately concludes that successful inclusion depends on a proactive design approach: instead of implementing accessibility solutions retrospectively, museums should be conceived as flexible ecosystems capable of ensuring an equivalent quality of experience for all users.¹⁷

Although immersive technologies offer significant opportunities, the literature also identifies important tensions and limitations that must be considered: VR may isolate users, while AR and audio-based solutions are generally preferred on-site experiences due to their capacity to preserve social interaction and spatial awareness.¹⁸

A further critical perspective on technologically mediated museum experiences is provided by Elodie Jarrier, whose study examines the use of interactive digital tools—particularly touchscreen tablets—in Fine Arts museums and their impact on visitor experience.

Jarrier analyses museum visits through four complementary experiential dimensions: cognitive, affective, sensory, and symbolic. The cognitive dimension concerns learning and knowledge acquisition; the affective dimension relates to emotions and pleasure; the sensory dimension includes visual, auditory, and tactile stimulation;

¹⁷ A. Brischetto *et al.*, "Enhancing Inclusive Experience in Museums: Results From a Field Study" *Design for Inclusion* 75, 2023, 132-144. <https://doi.org/10.54941/ahfe1003334>

¹⁸ V. Komianos, "Immersive Applications in Museums: An Analysis of the Use of XR Technologies and the Provided Functionality Based on Systematic Literature Review" *JOIV : International Journal on Informatics Visualization* 6(1), 2022, 60. <http://dx.doi.org/10.30630/joiv.6.1.708>

Design of Itineraries and Scenarios

the symbolic dimension addresses the meanings visitors attach to their visit and its relation to self-perception.

Based on a field study conducted at the Musée des Beaux-Arts d'Angers, the author compares visitors undertaking a traditional self-guided visit with those using interactive tablets offering multimedia content such as videos, zoom functionalities, explanatory texts, and playful interactive features.

The findings reveal a contrasted impact of interactivity. The digital tool significantly enhances cognitive engagement that improves visitors' understanding of the artworks through complementary information and multimodal interpretation. By making the visit more playful and reducing the sense of intimidation often associated with Fine Arts museums, it also strengthens the affective dimension.

At the same time, the study identifies the risk of what may be described as a "screen effect." One of the major concerns is that the mediation device may monopolise visitors' attention, leading users to focus more on the interface than on the physical artwork itself. In such cases, the museum visit risks becoming a technological activity rather than an aesthetic and embodied encounter with the object.

Interactivity, though, can support personalisation by allowing visitors to actively shape the rhythm and depth of their visit.

For this reason, Jarrier ultimately concludes that interactive mediation tools are powerful instruments for attracting and engaging new audiences, provided they function as a bridge toward the object rather than a substitute for it.

This consideration is particularly relevant for immersive sonic mediation, where the challenge is to ensure that digital sound layers reinforce, rather than overshadow, the physical presence and cultural meaning of the exhibited object.¹⁹

Taken together, these perspectives point toward the need for a balanced model of sonic immersion within museum environments. Nevertheless, there is still resistance and a lack of attention to audio technology. Sound and music have always been considered of minor importance, if not disturbing. Insufficient attention is paid to sound technologies for single or collective listening, and their day-to-day management. Despite the growing recognition of the cognitive, social, and inclusive value of sound-based mediation, its implementation in museum practice continues to face significant institutional and operational constraints.

In this context, empirical studies on visitor expectations become essential for assessing whether current museum practices still correspond to contemporary audience needs and perceptual habits.

¹⁹ E. Jarrier and D. Bourgeon-Renault, "L'enrichissement de l'expérience de visite muséale par l'utilisation d'outils interactifs de médiation" *Décisions Marketing* 1(97), 2020, 87-101.
<https://doi.org/10.7193/DM.097.87.101>

1.2.6 Historically Informed Virtual Reconstructions

Virtual reconstructions in archaeology and architecture refer to digitally recreated artefacts as they may have originally appeared or evolved over time. They are especially useful when dealing with lost or incomplete past contexts. Due to the frequent lack of complete evidence, these virtual reconstructions cannot be considered definitive or exact representations, but rather informed approximations that help us better interpret the past. Often, they represent one of several possible reconstructions consistent with the current state of research, which can be continuously updated as new discoveries emerge. Their creation typically combines bottom-up and top-down approaches: the former focuses on documenting and analysing physical remains, while the latter involves studying historical, literary, and iconographic sources, as well as architectural theories, and includes comparisons with similar cases. Virtual reconstructions help the public better understand artefacts and their context by making abstract historical information more concrete and accessible, while also fostering interaction and cognitive engagement.

Design choices depend on the intended audience. For experts, reconstructions emphasize analytical detail and technical data, including materials, construction techniques, structural information, and links to databases. For non-experts, experiences are more narrative, sensory, and engaging; holistic and experiential approaches are preferred over purely analytical ones, although scientific accuracy must still be maintained. These reconstructions aim to communicate architectural forms, the function of spaces, cultural context, and historical background.

A key issue is scientific transparency in reconstruction. It is often difficult to distinguish between original elements and hypothetical ones if sources and interpretation processes are not clearly presented.

Authenticity of the experience requires clear verification processes. Guidelines like the one provided by the London Charter and Seville Principles²⁰ help address this issue by promoting transparency, reliability, reproducibility, and documentation of sources. Without such standards, reconstructions risk becoming purely sensational.²¹

Researchers have developed methods to represent levels of reliability in virtual reconstruction models. Graphic techniques, for instance, can differentiate between certain and interpretative elements, while supporting sources can be interactively linked to each component.

²⁰ V. M. Lopez-Menchero and A. Grande, "The principles of the Seville Charter" *Proceedings of the CIPA Symposium*, 2011, 12-16; London Charter. Available online: <https://londoncharter.org/> (accessed on 172 of April 2026); The Principles of Seville. Available online: <http://sevilleprinciples.com/> (accessed on 172 of April 2026).

²¹ E. Pietroni and D. Ferdani, *op. cit.*, 2021.

Similarly, narratives in cultural heritage must remain plausible and credible, integrating verified facts with probable contextual information. In this regard, colour-coding systems may be used to indicate levels of certainty, as illustrated in fig. 2.

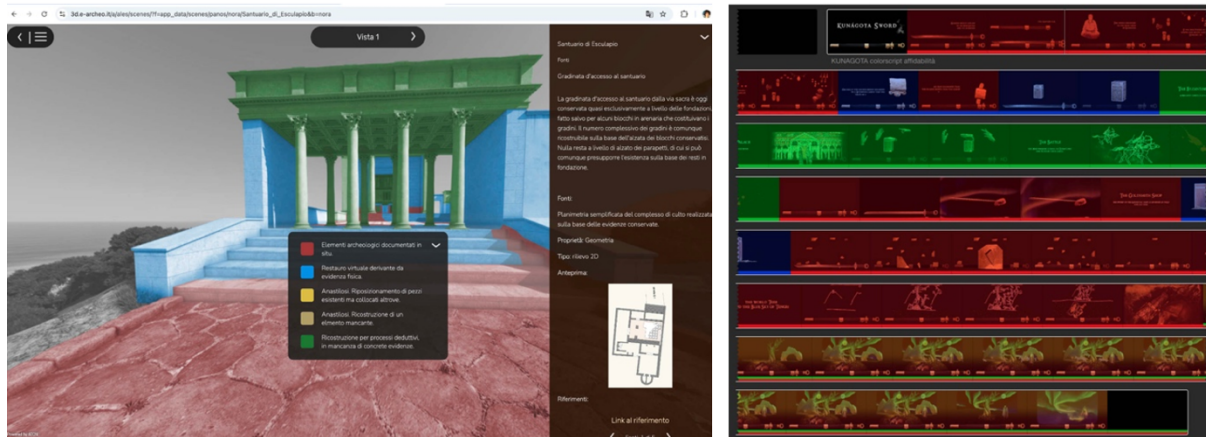


Figure 2. **On the left:** example of a virtual reconstruction of an archaeological site with evidence of reliability levels and related supporting sources (e-Archeo 3D project e-archeo.it, Progetto Katatex-ilux and University of Padua, in collaboration with CNR ISPC and ALES SpA). **On the right:** visualisation of reliability levels applied to a movie timeline (The Kunagota Sword, represented by CNR ISPC in the CEMEC project <https://vimeo.com/236305120>).

Within the field of musicology, the analysis of both historical sources and musical scores is carried out using methodologies specific to the discipline. Archival and historical research enable the reconstruction of historical context, while musical philology supports the reading and understanding of written sources.

Specific conventions embedded in notation software (e.g., Sibelius) also make it possible to document the processes of transcription into modern score format, as well as any necessary interventions required to render intelligible music that may be lost or damaged (as an example see <https://ricercadatalab.cesr.univ-tours.fr/en/sources/209/scores/part/3694/>).

Musicology, musical philology, and historically informed performance practices (e.g., the use of appropriate tunes, instruments, pitches, and interpretative approaches) support the reconstruction of missing voices (for instance in polyphonic works), as well as instrumental or accompanying lines. All data connected with musical details and its reconstruction are encoded in MEI to ensure the transferability of data in accordance with the FAIR principles.

In PlaceMUS XR virtual museums, documentary sources and the interpretative processes used to create virtual reconstructions—at architectural, musical, or narrative level—will be referenced. These will be integrated into a complementary analytical layer for expert users, providing an in-depth overview.

1.2.7 Audience Expectations and the 2026 CNR ISPC Survey

A survey conducted between December 2025 and January 2026 by CNR ISPC supports this view and served as a preliminary step toward the broader and more structured study developed by PlaceMUS XR within WP5. The goal was to investigate the audience's perceptions of the role of sound in museum spaces and assess whether the traditional model of the silent museum still meets audiences' expectations.

The quantitative-qualitative study involved a heterogeneous group of 120 participants, mostly Italian and to a lesser extent German. Data showed that 90.5% of the participants would prefer to hear sounds in museums.

This result reveals the general public's shared view of sound as a semantic, rather than decorative, element, capable of enriching the understanding of artworks. Central to the findings is the request for an emotionally engaging rather than intrusive sonic experience.

Sound emerges as a powerful tool for contextualization, capable of rendering history more "alive," enhance the meaning of artworks, and promote concentration, sensory immersion, and a better comprehension of museum exhibitions. It is also relevant in terms of accessibility, particularly for children and people with visual impairments. As such, sound acts as a connector between the object, the space, and the visitor's lived experience. In terms of technologies, participants in the 2026 survey most frequently expressed a preference for shared and diffuse sound experiences, perceived as less isolating.

Taken together, these findings provide both theoretical and empirical support for the methodological choices underpinning PlaceMUS XR, particularly regarding immersive sound design, shared listening environments, and embodied mediation strategies.

1.3 Methodology to Identify and Design Scenarios and Itineraries

To ensure methodological coherence and alignment across the Consortium, the preliminary work to design musical itineraries was structured through a series of coordinated activities within Task 3.1.

As a first step, a shared methodological framework providing a common conceptual and practical foundation for subsequent activities was established based on the Grant Agreement. Subsequently, a uniform template was designed and adopted to enable the systematic collection of data from all partners (see table I, below). This helped gather detailed information on the proposed musical itineraries, ensuring comparability and consistency across case studies. The collected itineraries were finally reviewed, commented upon, and discussed with the respective authors

D 3.1

Design of Itineraries and Scenarios

(through online meetings or by emails). This process fostered an iterative process of refinement, validation, and co-creation.

Specific meetings were also organised with representatives of museums and heritage sites, as well as associated partners hosting the itineraries (including museums in Mantua, Venice, Ferrara, Rome, Naples, Bologna, Cremona, among others). This process facilitated both the identification of places and the integration of stakeholders' expectations into the design process. A dedicated form was used to define collaboration terms with partner institutions, helping to formalise agreements for the development of the itineraries. Thanks to these inputs, the project proceeded to the development of the itineraries' structures, each grounded in distinct and heterogeneous conceptual approaches. This was complemented by the design of user journeys, which take into account diverse user profiles, as well as options for personalisation and the integration of digital tools. Once the accessibility and permissions of heritage sites have been verified, nine itineraries are designed.

The project will implement at least seven itineraries, considering any difficulty which could arise.

Each itinerary comprises: 1) at least four places integrating musical repertoires or historical soundscapes; 2) a 3D model with spatial audio; 3) interactive 360° panoramas or other visual representation to access remaining stops. Each place includes a minimum set of digital assets: 3D objects, live performances or archival recordings, 4K introductory video, 360° video recordings, and audio-visual interviews.

In general, the selection of case studies reflects the diversity of European musical heritage across genres, periods, and regions (OBJ-03), with each itinerary highlighting a specific cultural context. The use of modular, multi-channel technologies ensures flexibility, scalability, and adaptability of content. Finally, the creation of connections between sites will enable the future expansion and integration of additional locations and itineraries.

Further considerations addressed copyright issues related to both the reuse of existing data (recordings, 3D models, video) and the production of new materials. Approaches to the 3D representation of Places of Music and associated interaction paradigms were also explored, with particular attention to their potential, benefits, and critical aspects in relation to the project objectives (in coordination with WP7).

During the first seven months, internal webinars have been organised to explore tools, methodologies, practices, and projects, and to share past and current experiences. These sessions helped build a shared knowledge base among consortium members for the development of the itineraries (nine webinars, starting in December 2025)

Subsequently, a data model has been proposed to support **GeoViz** functionalities and related developments to ensure interoperability and scalability across the project's digital ecosystem.

Table I. Form used to collect information on case studies

Form to collect information on case studies
Title of Case Study (= itinerary)
<p>Description of the itinerary (max 500 words): <i>Please include some photos of places you want to include in the itinerary</i> Please indicate which is the Ground Concept your itinerary is based on. (Choose among possibilities indicated at paragraph 2.7)</p> <p>1. Context:</p> <ul style="list-style-type: none"> • City/Region: • Geographic coordinates in WGS84 for each point of interest along the itinerary (<i>right click on Google Maps, the first item at the top</i>): • Historical period: • Description of the itinerary and musical journey: • Specific challenges of the itinerary/sites: (<i>e.g., isolation, lack of promotion</i>) • Project objectives at the sites: (<i>What does the project aim to achieve at this location?</i>) • Promotional strategies: (<i>How will the site and the musical experience be promoted?</i>) • Collaborations: (<i>Which organisations or institutions are involved?</i>) <p>2. Musical genre:</p> <ul style="list-style-type: none"> • Function of music: (<i>What role did music play in this context?</i>) • Cultural significance: (<i>Why is this music culturally important?</i>) • Combination with other performative arts (<i>e.g. ballet, sacred representations, liturgy, ceremony, acting, opera, works</i>) • Social impact: (<i>What is the music's impact on the community?</i>) • Key figures: (<i>e.g. musicians, composers, players, patrons</i>) • Principal locations where it was/is played: (<i>e.g. churches, palaces, theatres</i>) • Space (<i>e.g. dimensions, structure, materials, acoustics</i>) <i>Specify the name of the building and, if possible, the specific name of the room (e.g. Vatican Museums, Sala della Segnatura)</i> • Musical instruments involved: • Musical events: (<i>e.g. concerts, festivals, academies</i>) • Technical issues related to the music style and structure (for expert audiences) (<i>e.g. concepts like counterpoint, drone, canon</i>) <p>3. Musical sources:</p> <ul style="list-style-type: none"> • Musical repertoire: (<i>Which pieces will be used by PlaceMUS? Where will they be sourced from?</i>) • Are there any existing audio/video recordings? (<i>If so, please specify</i>) • Which musicians/ensembles will be involved? • Indicate which laws are in force in the country for copyright, registration, and reuse • Has the place of music privileged collaborations with specific musical ensembles or musicians? • Available historical documentation and literature: (<i>Please specify the type of documents</i>) <p>4. Connected artistic objects or documents:</p> <ul style="list-style-type: none"> • Type of objects: (<i>e.g. instruments letters, books, paintings, sculptures, musical scores, museum objects</i>).

- Authors of the objects:
- Location of the objects (still on site or in a museum):

5. Bibliographical References:

6. Accessibility:

- Is the place where the music was originally composed still preserved? Has it been transformed or destroyed?
- Are the original acoustic features of the place preserved, or have they changed?
- Is the place accessible to the public, or is it private?
- Is the place open to tourists?
- Is there any fee for audio or video recording?
- Is there any available 3D model of spaces, objects, in which format?
- Would you recommend specific lost places that we could virtually reconstruct?
- Who are the responsible and contact person of the place of music (request letters)

7. Technological Aspects:

- Is it possible to create site specific installations across the itineraries? If yes, in which locations?
- How could the sound be experienced on site? (*using headphones, or speakers, or through directional speakers/sound showers, or through immersive VR, or using only personal devices through a QR code?*)
- Which immersive technologies would you encourage? (*e.g., collective space of experience, as a room with video-projections and with diffused audio, or single user immersive virtual reality, or augmented reality through mobile or bone conduction headphones?*)
- How can the technologies be integrated into the site? (*Describe how you envision the installation and visitor interaction*)
- What are the objectives of using these technologies? (*e.g., to create an immersive experience, to increase visitor engagement*)
- **Inclusivity aspects:** (e.g., haptics technologies; audio and visual: MF, OU, CNRS)
- **Specify equipment and technologies** used for **data acquisition** (MF, CNRS)
- **Further relevant information:** (Any other details you consider important)

1.3.1 Identification of Places of Music

The project's itineraries are designed to encompass multiple categories of sites, reflecting the diversity and breadth of Europe's musical heritage. We have identified the following three categories:

1) Sites of music creation and practice

- places where music was performed;
- places where music was commissioned;
- places where music was composed;
- places where music was taught;
- venues with distinctive or exceptional acoustic properties;
- places where music intersected with other performing arts.

2) Sites of musical craftsmanship and production

- musical instruments makers workshops;
- musical print houses.

3) Sites of musical heritage

- places preserving past and current musical tradition;
- places where musical traditions have evolved or transformed;
- places where musical identity has been lost or erased (e.g., a theatre converted into a cinema; a musician's home replaced by a parking area), but whose memory can be preserved, reconstructed, and emphasised through historical soundscape reconstruction.

Through these categories, we seek to inspire museum curators and conservators to evaluate the possibility to create itineraries aimed at promoting the musical heritage of historical sites typically known only for their artistic and architectural significance.

We aim to communicate the historical and musical significance of the different places of music through engaging, layered, and diversified forms of storytelling. This will feature Story Maps combining spatial navigation with sound and narrative depth. By integrating geolocated content with multimedia and interpretative frameworks, these itineraries are conceived to stimulate curiosity, sustain user engagement, and make complex cultural narratives accessible to a broad and heterogeneous audience.

We intend storytelling not merely as a communicative device but also as a methodological framework allowing users to navigate cultural heritage both geographically and conceptually. In doing so, the itineraries will foster connections between different temporalities, artistic expressions, and social dimensions of musical life.

1.3.2 Musical Significance

Nowadays, music is increasingly relegated to an accompanying role within everyday activities. It functions as a “soundtrack” conferring an additional dimension upon ordinary lived experience. It is present in transitional spaces — while walking, driving, doing sport, or shopping — as well as in the workplace. In these contexts, it has become commonplace to perform multiple activities simultaneously while “listening” to music. This phenomenon has been widely examined within the fields of sound studies and sociology of music, which highlight how contemporary listening practices are embedded in patterns of mobility and in the management of everyday experience.²²

²² T. DeNora, *Music in Everyday Life*, Cambridge: Cambridge University Press, 2000;
M. Bull, *Sounding Out the City: Personal Stereos and the Management of Everyday Life*, Oxford: Berg, 2000;
M. Bull, *Sound Moves: iPod Culture and Urban Experience*, London: Routledge, 2007.

Design of Itineraries and Scenarios

Such modes of engagement, however, are primarily driven by functional needs — pleasure, concentration, emotional regulation — rather than by a form of listening oriented towards the understanding of music as an autonomous cultural object. As DeNora (2000) argues, music operates as a “technology of the self”, contributing to the modulation of affective and cognitive states, while more recent studies have emphasised the transformation of listening into a ubiquitous and often decontextualised experience.²³

PlaceMUS XR aims to fundamentally transform modes of experiencing and engaging with music in relation to Cultural Heritage. In particular, the project’s itineraries seek to establish attention to the intrinsic relationship between music and the spaces in which it was composed, performed, and preserved. This perspective enables the exploration of new forms of musical knowledge and pedagogical paths, grounded in the integration of music and sound with their historical, anthropological, and material contexts.

These elements help make European musical heritage accessible again at its places of origin while reinforcing the perception, transmission, and authenticity of the aesthetic experience through digital tools. As such, the project is aligned with the principles of the New European Bauhaus which favour a model of heritage promotion based on accessibility, experiential engagement, and interdisciplinary integration.

For these reasons, the itineraries are conceived as pathways that combine discovery with in-depth exploration. They are structured around historical, musicological, acoustic, anthropological, and cultural dimensions, and tailored to each site and installation. Within this framework, music, restored to its original context, becomes a privileged medium for the transmission of a shared cultural message. The musical significance of the itineraries’ experiences will be articulated through the multidisciplinary expertise of the consortium’s researchers.

1.3.3 Initial Analysis of Previous and Current Initiatives

In recent years, EU-funded research in the field of music and heritage has primarily focused on the creation and organization of digital resources, such as databases, corpora, and online cataloguing systems (e.g., the *Polifonia* Project <https://polifonia-project.eu/>). Other major strands of work include AI-assisted digitisation and classification of manuscripts, 3D audio capture, immersive streaming solutions (e.g. *Repertorium* project <https://repertorium.eu/>), initiatives to record live performances and expand public access to the performing arts (e.g. *Premiere* <https://premiere-project.eu/>), 3D virtual acoustics, and sound archaeology (see the project AURAL <https://www.ispc.cnr.it/en/2023/03/21/aural/>).

²³ D. Hesmondhalgh, *Why Music Matters*, Oxford: Wiley-Blackwell, 2013;
A. Kassabian, *Ubiquitous Listening: Affect, Attention, and Distributed Subjectivity*, Berkeley: University of California Press, 2013.

Design of Itineraries and Scenarios

Among these initiatives, two projects deserve attention. The first is *REM@KE Reconstructing Embodied Musical Knowledge at the Keyboard* (<https://re-make.unipv.it/it/>). This interdisciplinary research project develops an integrated approach to studying and experiencing musical instruments and the people connected to them. Its objective is to reconstruct the sound and function of lost instruments, while creating new theoretical, empirical, and practical tools to explore the embodied musical knowledge that emerges from their interaction with performers.

The second is *Voicing Spaces*. Funded by the Fondo Italiano per la Scienza (<https://www.unipa.it/dipartimenti/cultureesocieta/Progetto-Voicing/Project/>), the project explores the relationship between vocal performance and space in ancient theatrical buildings, with particular emphasis on how acoustics impacted audience's auditory experiences. The project draws on archaeology, sound studies, acoustics, and advanced digital and VR technologies to explore tangible and intangible musical heritage.

Beyond PlaceMUS XR, within the European Cultural Heritage Cloud framework, two other sister projects address musical heritage—both tangible and intangible—and contribute to a broader European ecosystem for access and innovation:

- 1) *MusicSphere A Multimodal Approach for Digitizing, Analyzing, and Simulating Traditional Musical Organs Through 3D Technologies, Acoustic Analysis and Interactive Experiences* (<https://musicsphere-eccch.eu/>) is dedicated to the study and digital preservation of Europe's musical heritage related to historical organs. It develops advanced tools combining 3D digitisation, acoustic analysis, and immersive VR and AR technologies to create highly accurate digital twins that capture not only the organs' physical features, but also their sound, mechanics, and interaction with architectural spaces. By integrating visual, acoustic, and historical data, MusicSphere provides new ways to research, restore, and experience these complex artefacts;
- 2) *UNICHE The No-Code Platform Powering the Future of Cultural Heritage* (<https://uniche-eccch.eu/>) develops a no-code platform for creating interactive cultural heritage experiences. It integrates AI and extended reality (XR) technologies to enhance storytelling, visitor engagement, and exhibition design. The platform enables non-experts—such as museum curators, researchers, and creative industries—to collaboratively produce immersive content across web, mobile, and VR environments. Tested in real-world heritage settings, the project supports scalable and personalised cultural experiences.

PlaceMUS XR is positioned at the intersection of fundamental research across Consortium members' and stakeholders' areas of expertise, the applied development of digital tools and methodologies, and the enhancement of data through discovery pathways and the promotion of musical and broader cultural heritage. The project's goal is to create tools and contents easily usable by non-experts along musical

Design of Itineraries and Scenarios

itineraries across Europe. By resorting to VR, sound AR, multimedia content, and historical soundscapes virtual reconstruction, the project seeks to transform how we experience Musical Heritage in our cities, schools, and museums. Building on the aforementioned scientific literature, PlaceMUS XR provides users with engaging and interactive experiences emphasizing the intersection of music, architecture, soundscape, landscape, space, time, cultural values, symbolic meaning, and ritual. To this end, the project draws on interactive experiences developed within the Polifonia project (in collaboration with the Open University Music Computing Lab), particularly the tool *Melody*, for the design of narrative-driven content (<https://projects.dharc.unibo.it/melody/>), which makes complex musical datasets more accessible.

PlaceMUS XR also builds on the Virtual Music Heritage initiatives, VMH (<https://virtual-music-heritage.fr/>). Led by Ricercar Lab (<https://ricercarlab.cesr.univ-tours.fr/>), VMH aims to elaborate new immersive and experimental sonic and visual experiences to bring musical heritage in cultural site. Among its initiatives, the *Cubiculum musicae* (supported by CNRS Innovation) provides site managers with new, specifically designed content and mediation tools to enrich visitors' experiences. Its design is based on a rigorous scientific methodology that situates each musical work within its historical and social context, paying special attention to the acoustic properties of the venues where music was originally performed. One of the system's major strengths is its adaptability: designed to integrate seamlessly into a wide variety of sites and contexts, the *Cubiculum musicae* is easy for on-site teams to use, allowing for quick and effective adoption.

The project is also inspired by the *Listen to the Theatre!* project. Developed by Mezzo Forte (<https://www.mezzoforte.design/?lang=fr>), this initiative explores the virtual acoustic environments of performance venues, exploring how sound perception varies across different listening positions within the same space (<https://www.maggiofiorentino.com/en/listen-to-the-hall/>).²⁴

1.3.4 What is New in PlaceMUS XR in Relation to Musical Itineraries Design

Compared to previous projects and initiatives, PlaceMUS XR innovates the design of itineraries and scenarios by moving beyond the static, expert-oriented, and purely visual approaches of earlier projects.

Unlike previous initiatives that mainly provide databases, catalogues, or fixed virtual reconstructions, PlaceMUS XR creates interactive, dynamic, and user-oriented itineraries. Cultural routes are not just “connections between places,” but multidimensional journeys encompassing physical spaces, people, themes, and history.

²⁴ A. Gozzi and G. Grazioli, “Listen to the Theatre! Exploring Florentine Performative Spaces”. In *Immersive and 3D Audio: from Architecture to Automotive* (I3DA), Bologna, 2023, 1-8.
<https://doi.org/10.1109/I3DA57090.2023.10288619>

Design of Itineraries and Scenarios

In addition to that, the project's itineraries introduce a multisensory and embodied approach to musical heritage that integrates sound, space, time, and narrative. This approach enables users to “travel back in time” by experiencing music within its original spatial and acoustic contexts—through sound, music, historically informed performances, and reconstructed soundscapes. In doing so, the itineraries offer a deeper, more immediate understanding than visual materials alone can convey.

Furthermore, unlike traditional geovisualisation tools that primarily focus on spatial data, PlaceMUS XR enables a comparative and analytical exploration of places across time. By integrating cartography, chronology, and storytelling within a single system, it makes these temporal and cultural relationships explicit and accessible.

Equally innovative is the multi-scale scenario design adopted for the itineraries. It operates as follows: 1) at a large scale, interactive maps allow users to explore relationships between places; 2) at a medium scale, 360° environments enrich exploration with storytelling, historical contexts, sound, and interactive objects; and 3) at a detailed scale, fully immersive 3D and VR simulations add spatialized audio for a more embodied experience. Together, these layers enable a seamless transition from overview to in-depth exploration—an integration not achieved in previous projects.

The project introduces new narrative forms for itineraries, combining documentary, storytelling, evocative, and performative elements. It also connects tangible and intangible heritage (objects, music, memories, environments), creating new cultural paths and tourism experiences that reveal hidden relationships between places through music.

Last but not least, PlaceMUS XR's scenarios are open and editable, not closed outputs. Cultural professionals can create and customize their own itineraries and virtual environments, enabling reuse, expansion, and continuous enrichment over time.

1.3.5 Case Studies Overview

The project develops a diverse yet coherent set of nine itineraries that collectively explore European musical heritage through territorial, thematic, and conceptual approaches. These itineraries span multiple regions—France, Georgia, Hungary, Italy, Poland, the United Kingdom (fig. 3)—and address a wide chronological range, from medieval and Renaissance repertoires to contemporary musical practices. Together, they articulate a shared methodological framework grounded in the relationship between music, space, and society, while integrating immersive technologies to enhance accessibility and engagement.



Figure 3. Overview of PlaceMUS XR journeys. Blue dots represent itineraries within single cities. Areas highlighted in red indicate itineraries through regions.

A first group of itineraries adopts a territorial and historically grounded approach, focusing on UNESCO-listed and other historically significant sites. The *Music in Renaissance Loire Valley* itinerary (France), developed by RicercarLab (CNRS–University of Tours), explores the historical soundscape of the Loire Valley—inscribed on the UNESCO World Heritage List—to emphasise the relationship between music and sacred and courtly architecture between the fifteenth and seventeenth centuries. It encompasses sites such as Tours’s Saint-Martin quarter, Châteaudun’s Saint-Chapel, and the royal castles of Blois and Chambord by integrating 4D reconstructions, *Cubiculum Musicae* installations, and historically informed performances of Renaissance composers such as Johannes Okeghem and Eloy d’Amerval.

Similarly, the *Music in Renaissance Ferrara* itinerary (Italy), also developed by RicercarLab, centres on the UNESCO-listed city of Ferrara as a major centre of musical innovation under the Este rule. It includes sites including the Cathedral Museum, Palazzo Schifanoia, the Church of San Cristoforo, Ludovico Ariosto’s house, and the convent of Sant’Antonio in Polesine. The itinerary explores both sacred and secular repertoires—plainchant, polyphony, madrigals, and other courtly forms—through immersive tools such as augmented reality and the *Cubiculum Musicae* ‘sound shower’ (a newly developed tool).

The *Madrigal Journey Through Renaissance Italy* itinerary adopts a mixed genre-based and trans-regional approach. Led by CNR, this itinerary connects major Italian cities—Rome, Ferrara, Florence, Naples, Mantua, and Venice—where the madrigal developed as a highly expressive genre combining music and poetry. By re-situating

D 3.1

Design of Itineraries and Scenarios

the madrigal in the courtly spaces for which it was composed—such as Palazzo Barberini in Rome, Palazzo Di Sangro in Naples, Palazzo Ducale in Mantua, Palazzina Marfisa (Palazzo Schifanoia) in Ferrara, and Palazzo Mocenigo in Venice—the itinerary contextualises the genre and highlights its transformation into a more theatrical and performative form, associated with highly influential composers, such as Claudio Monteverdi.

Other itineraries focus on the interaction between music, architecture, and urban space. *The Organs, Sacred Architecture, and Urban Soundscapes in Krakow* itinerary (Poland), developed by MAP-CNRS and the Krakow University of Technology, focuses on Tynieć Abbey, the Church of the Holy Cross, St. Florian Church, and the modern Lord's Ark Church. Through acoustic simulation, spatial audio, and historical reconstruction, it demonstrates how organ music shapes and is shaped by architectural environments across historical periods in the culture of Krakow.

The *Listening to the Past in Bologna's Museo della Musica* itinerary (Italy) adopts a museum-based approach centred on the sixteenth-century Palazzo Sanguinetti (the museum's current venue). Developed by Bologna's Museo internazionale e biblioteca della musica, this itinerary brings to life selected objects from its collections—musical instruments, manuscripts, portraits, and documents associated with famous historical figures (e.g., Padre Martini, Wolfgang Amadeus Mozart, Antonio Vivaldi, and Gioachino Rossini)—by providing sound and contextual interpretation through dedicated installations.

Led by Cremona's Museo del Violino (Italy), the *From Wood to Sound: The Northern Italian Art of Violin Making* itinerary explores the UNESCO-recognised intangible heritage of Cremonese violin making. It connects the Museo del Violino with the city's network of workshops, the Violin Making School, the Stauffer Academy, and other Italian research laboratories (i.e., the University of Pavia and Politecnico of Milan). The itinerary traces the stages of violin making and performance, from raw materials to practice, linking craftsmanship, acoustics, and artistic practice.

Two further itineraries focus on living musical traditions and cultural transmission.

The first is the *Music in Budapest: From Liszt to the Táncház* itinerary (Hungary). It explores the evolution of Hungarian musical identity, from the music of Franz Liszt to the twentieth-century ethnomusicological work of Béla Bartók, Zoltán Kodály, and László Lajtha, culminating in the Táncház movement—a practice of community dance in private homes, now inscribed on the UNESCO Intangible Cultural Heritage list. The itinerary develops around the Liszt Academy district and connects institutions such as the Liszt Memorial Museum and the Hungarian Heritage House with public spaces and festivals, highlighting the interaction between folk traditions and art music.

The second is the *Journey Through Georgian Polyphonic Traditions* itinerary. Focusing on the Guria and Kakheti regions, it explores Georgian polyphony—recognised by

Design of Itineraries and Scenarios

UNESCO—as a living practice rooted in domestic, ritual, and communal contexts. The itinerary contextualises this musical practice within social environments such as homes, feasts, agricultural settings, and churches, documenting vocal techniques and transmission practices through immersive and ethnographic approaches.

As another possible case study (not included in section III), *The Cinematic Soundscapes of Ennio Morricone: An Immersive Exploration of Music and Film* is a *biographical* itinerary dedicated to the famous Italian composer. It includes locations in Rome related to Morricone's life, music, and legacy. Morricone's innovative and evocative scores have become synonymous with the cinematic experience, shaping the way audiences perceive and engage with film narratives. The itinerary may include Cinecittà Studios (the legendary film studio where Morricone collaborated with renowned directors like Sergio Leone and Bernardo Bertolucci); the Italian RCA, the Forum Music Village; the International Recording; the Accademia di Santa Cecilia. Unfortunately, most of these places no longer exist, as they were abandoned or transformed. This criticality, in tandem with the difficulty of dealing with Morricone's heirs and rights usage, suggests caution when undertaking the design of this itinerary—especially in terms of costs and time. For this reason, a possible solution is to develop a sound augmented reality experience along the itinerary, instead of an audio-visual one. In this way, copyright issues can be solved quite easily.

The PlaceMUS XR project also includes a non-territorial and conceptual itinerary. Developed by the Open University, the *Exploring the Evolution of Harmony in Popular Music in the UK* itinerary begins from place-based heritage by presenting harmonic structures in popular music as interactive spatial journeys within a digital environment. Through collaborations with institutions such as the National Museum of Popular Music in Liverpool (The British Music Experience), it enables users to visualise and interact with chord sequences through digital dynamic activities. This hands-on approach fosters an inclusive and participatory engagement with musical knowledge.

Across all itineraries, a shared methodological approach emerges. Each itinerary combines historical research, cultural interpretation, and technological mediation, integrating virtual and augmented reality, spatial audio, 3D modelling, and web-based platforms. The itineraries also address key challenges, including the invisibility of music in heritage contexts, the fragmentation of sources, and the need to balance historical accuracy with immersive reconstruction.

The design of these itineraries shows how musical heritage—both tangible and intangible—can be reinterpreted through interdisciplinary and innovative, technology-driven approaches. By connecting diverse European regions, institutions, and traditions, these itineraries contribute to a renewed understanding of music as a spatial, social, and experiential phenomenon, while supporting its preservation, accessibility, and transmission.

Design of Itineraries and Scenarios

1.3.6 Verifiability and Measurability Based on Key Performance Indicators (KPI)

The successful implementation of itineraries, scenarios, and digital tools to improve interaction with content and users, can be verified and measured through Key Performance Indicators (KPI).

To measure the workability of Objective 1, “To create, share and re-use scenarios, contents, exhibits and improve interactions with places and objects of music,” the project will adopt the following KPIs:

KPI 01.1	Percentage of use of developed tools in scenarios production	A percentage of developed tools will be used in scenarios production, along a coherent production pipeline.	=100%
KPI 01.2	Number of tools developed to design exhibition spaces and sound content along the paths, and tracking visitors	A number of tools will be developed to support exhibition design (especially sound communication in exhibitions) and for tracking visitor's sessions	≥ 2
KPI 01.3	Number of tools developed to improve the visit experience of real or virtual expositions with any device	A number of tools will be developed with special attention to easiness in use, usability in different context, accessibility through any device	≥ 5
KPI 01.4	Number of tools developed to interact with contents of various sizes and scales of representation	A number of tools will be developed to access and interact with a wide range of cultural objects, different in typologies and size	≥ 5

To measure Objective 2, “To analyse, design, and test the interactions with visitors,” the following KPIs will be adopted:

KPI 02.1	Number of stakeholders involved	A number of stakeholder (museum, libraries) will be involved to investigate needs and expectations and to test developed contents/tools	≥ 8
KPI 02.2	Number of industries involved	A number of creative industries will be involved to investigate needs and expectations and to test developed contents/tools	≥ 30 SMEs
KPI 02.3	Number of schools involved	A number of educational institutions will be involved to investigate needs and expectations and to test developed contents/tools	≥ 10
KPI 02.4	Number of visitors involved	A number of visitors will be involved to test developed contents/tools	≥ 200 visitors

To measure Objective 3, “To design and create itineraries and places of music as Extended Realities”, the following KPIs will be adopted:

D 3.1

Design of Itineraries and Scenarios

KPI 03.1	Number of case studies developed	A number of representative itineraries is established to validate methodological approach and pertinence of interactive tools to satisfy project's ambitions	≥ 7 itineraries
KPI 03.2	Variety of regions, genres, audiences	Case studies must represent a number of diversities in terms of Countries, genres and audiences.	≥ 4 regions ≥ 4 genres ≥ 4 audiences
KPI 03.3	Number of place of music with cultural/touristic potentialities to be developed	A number of places of Music will be selected to promote and enhance their touristic potentiality	≥ 15 places
KPI 03.4	Number of cultural objects categories included	Different categories of objects will be included (architectures, urban assets, soundscapes, painting, sculptures, furniture, dresses, manuscripts).	≥ 10 categories
KPI 03.5	Number of digital objects categories included	Texts, images, 3D mesh models, sounds, cartography	≥ 5 categories

To measure Objective 04, “To foster a deeper understanding of sound, architectural forms, and space”, the following KPI will be adopted:

KPI 04.1	Number of spatial-acoustic simulation developed	A number of spatial-acoustic simulations are established to validate methodological approach in reliable VR immersive experiences	≥ 5
KPI 04.2	Number of spatial-acoustic reconstructions of no longer existing contexts	A number of no longer existing places of Music are selected to allow virtual enjoyment of past contexts	≥ 1 places

To measure to Objective 6, “To create and promote accessible solutions for extended interaction with places of music”, the following KPIs will be adopted:

KPI 06.1	Level of inclusion: number of categories of impairments considered	Accessibility strategies and tools must include as many citizens as possible, including: 1) sensory impairments, 2) physically impairments, 3) cognitive impairments.	= 3
KPI 06.2	Level of inclusion: Number of Age groups	Accessibility strategies and tools must include as many citizens as possible across different age groups: 1) children, 2) teenagers, 3) adults, 4) elderly visitors.	= 4
KPI 06.3	Number of languages in content	Contents are implemented in a number of languages.	≥ 3
KPI 06.4	Number of languages in tools interfaces	Tools interfaces are implemented in a number of languages.	≥ 1

To measure Objective 7, “To develop, share, re-use dataset and tools in accordance with ECCCH”, the following KPIs will be adopted:

Design of Itineraries and Scenarios

KPI 07.1	Number of developed tools integrated into ECCCH	A number of developed tools is integrated in ECCCH, (software, methodological workflow, TUI design)	= 11
KPI 07.2	Percentage of developed content integrated into ECCCH	A percentage of developed contents is integrated in ECCCH	≥ 90%
KPI 07.3	Percentage of dataset accompanied by metadata	A percentage of dataset are supported by metadata following ECCCH formalism	≥ 90%
KPI 07.4	N. of new scenarios created with tools integrated in ECCCH	A number of new scenarios are created by professionals using PlaceMUS tools, integrated in ECCCH	≥ 3

I.4 Integration of Feedback from the Preliminary Survey

The user experience designed for the itineraries will also consider the results of WP5 (Preliminary User Analysis and Design), particularly the data currently being collected through Task 5.2 (Data Analysis and Interpretation).

I.4.1 Objectives

Deliverable D5.1 of WP5 presented a preliminary study plan involving different user groups. Its primary objective is to inform and guide the subsequent design and development of immersive sound- and image-based experiences.

D5.1's methodological framework is grounded in the PACT model (*People, Activities, Contexts, Technologies*), which informs both the design of the questionnaires and the interpretation of the collected data. This ensures methodological consistency across target groups and alignment between user needs, project objectives, and design decisions.

This methodological approach is centred on a set of structured, multi-target questionnaires, specifically designed for the project's six stakeholder groups:

- Consortium partners;
- researchers;
- museum curators;
- educators and students;
- cultural and creative industries (CCIs);
- the general public (visitors, citizens, and tourists).

The surveys aim to:

- collect diverse perspectives on musical and sonic heritage in relation to places;
- identify commonalities and differences across user groups;

D 3.1

Design of Itineraries and Scenarios

- highlight contextual factors influencing the use and perception of sound-based experiences;
- mitigate the risk of technology-driven design choices disconnected from actual user needs.

Accordingly, the survey questions have been developed to capture both:

- trends shared across all target groups (common core section);
- role-specific requirements through dedicated sections tailored to each stakeholder category.
- Special attention has been given to universal design principles and accessibility.
- Building on analysis of the questionnaires' results, additional qualitative methods will be implemented in subsequent WP5 phases, notably:
 - semi-structured interviews;
 - focus groups.

Integrating quantitative findings with qualitative observations will strengthen the robustness and reliability of the analysis and support evidence-based decision-making in the following project phases.

Because of the exploratory and preliminary nature of the user studies, the surveys do not aim to achieve statistically representative samples for each target group. Instead, their goal is to gather a sufficiently robust number of responses to identify:

- meaningful trends;
- recurring patterns;
- priority issues;
- support the evaluation of design requirements without presupposing definitive technical solutions.

Each target groups' size varies depending on accessibility, availability, and recruitment context. A larger participation is expected from the "general public" group through museum-based survey dissemination, whereas smaller but more focused samples are foreseen for groups such as researchers, curators, and CCIs.

The Consortium aims to involve approximately 40 to 50 participants per target group, as comparable sample sizes will facilitate cross-group comparisons in terms of preferences, needs, and expectations. These sample sizes refer to a consortium-level objective and not to individual quotas per partner.

1.4.2 Translation of User Research into Design Requirements

Survey data are systematically translated into design-relevant insights through a structured analysis process, including the identification of recurring patterns, user needs, and contextual constraints. These insights are subsequently formalised into design requirements that directly inform the development of the immersive itineraries.

The formulation of design requirements is based on a triangulation approach combining: 1) survey data, 2) insights from existing literature on immersive and sonic heritage experiences (l. 2 Methodological Framework and Scientific Background), and 3) project-specific constraints. While the survey data provide empirical evidence of user expectations and practices, the literature offers validated frameworks and design principles. The resulting requirements emerge from the alignment of these two sources.

The integration process follows four main steps (WP5 - Task 5.2.):

- 1) data collection (questionnaires and qualitative methods);
- 2) data analysis (trend identification and cross-group comparison);
- 3) interpretation through the PACT framework and relevant literature;
- 4) translation into design requirements and user experience guidelines.

For instance, if questionnaire responses show that visitors prefer audio content linked to their physical location, this leads to a design requirement: to implement location-based sound delivery systems (e.g., via GPS) that automatically trigger content when users enter specific spatial areas or reach defined points of interest. This approach is consistent with the literature on situated and immersive storytelling.

These requirements are subsequently transferred to WP3's Task 3.2 (design/development work packages), to guide the prototyping and implementation phases.

1.4.3 The Surveys' Current Status

The questionnaires were created on the LimeSurvey platform and have been made available since March 2026.

Although English is the main language, the questionnaires are also available in other languages, depending on the recruitment areas and data collection pools. These languages are:

- Italian;
- French;
- Georgian;
- Polish;
- Hungarian.

D 3.1

Design of Itineraries and Scenarios

As of today, 165 online questionnaires have been completed across different target groups. The analysis of these initial findings makes it possible to identify key trends, practices, and expectations regarding the design of immersive experiences about musical heritage. These preliminary results inform the case studies' development. To best address the needs of the different target groups, the design of these itineraries will continue to be carried out in parallel with the analysis of questionnaire responses, along with the implementation of focus groups with children.

Since the dissemination of survey links is still ongoing, a significantly higher number of responses is expected by 14 August, which is the envisaged deadline for the data collection phase.

Section II: Requirements and Criteria to Design Scenarios and Itineraries

What criteria generate experiences that are both engaging and enriching?

Engaging experiences that evoke a journey across European musical sites can be shaped not only by technological strategies, but also by interaction metaphors—both between users and objects and among users themselves—as well as by storytelling.

A journey may include:

- landscape's topographies, along with specific soundscapes that convey a sense of regional, urban, or place-based identity, the natural environment, and human activities—including local traditions, cultural life, ceremonies, economic activity, interpersonal encounters, and moments of spiritual elevation—must all be considered. Examining these cultural and social contexts is essential to fully understand the significance of musical events;
- journeys across harmony (Open University) are another challenge. Harmony is like a land to be crossed: consonances, dissonances, resolutions, suspensions, waiting, cadences, and silences can be translated into a sonic journey, but also a visual one. Such journeys allow users to move through different worlds and discover that:
 - each culture engages with different scales and intervals;
 - each culture offers a different way of understanding balance and tension;
 - harmony is not a single rule, but a language in constant evolution.

II.1 Designing Experiences for Places of Music

The wide variety of musical genres, together with the multiple historical layers of European cities and regions, gives rise to a complex, multi-level framework. This framework is shaped not only by music and musical culture, but also by their connections to urban environments, landscapes, architecture, and historical events. It further draws on visual arts and a wide range of musical sources—instruments, manuscripts, scores, and private correspondence—as well as first-person narratives by historical figures, all situated within their broader social and cultural context of cities, churches, castles, museums, and other historical settings. The reception of musical styles and composers by critics and audiences reflects how musical tastes change over time. These shifting attributions of value are also considered as an

Design of Itineraries and Scenarios

integral part of the project's narrative and contribute to the understanding of heritage significance.

The itineraries aim to design and disseminate places of music as heritage digital twins—digital replicas of cultural heritage objects enriched with knowledge layers, interpretative perspectives, attributed meanings, relationships to other entities, and digital documentation. Together, these components form a virtual heritage ecosystem that integrates both tangible and intangible values addressed by PlaceMUS XR's tools and methodologies.

Thanks to the PlaceMUS XR itineraries, users will discover that routes and sites already known for their artistic and architectural significances often played a major role in the history of European music. As such, the project creates new knowledge while favouring cultural tourism beyond the current offer.

Virtual and augmented reality technologies contribute to enhancing both cognitive and emotional engagement in ways that traditional travel guides and educational tools cannot.

II.2 Itineraries Design

The design of the itineraries includes what is listed below.

II.2.1 Types of Itineraries

Four distinct types of itineraries will be developed, each offering a different perspective on the history of European music and its relationship to places, people, and societies. These include musical genre-based itineraries, territorial itineraries, biographical itineraries, and site-specific itineraries. Together, they provide complementary approaches to understanding how music is created, performed, experienced, and preserved across time and space:

- **musical genre-based** itineraries will focus on specific music genres—such as organ music, dance music, or the Italian madrigal. Each itinerary will explain the nature of the genre, the instruments involved (including the human voice), and its origins, as well as the types of venues in which it was historically performed. Particular attention will be given to performance practices and reports of audience behaviour during musical works' first performances, alongside the broader social, political, and economic contexts that shaped the genre. The itineraries will also explore the genre's cultural significance for its audiences and highlight connections with other art forms as well as civic and religious traditions. A central component will be the analysis of performance spaces: their acoustic properties, major historical events, the performers and audiences involved, and the ways in which music was experienced in these settings. Where relevant, existing collections of musical instruments and primary sources will also be incorporated. The duration and

Design of Itineraries and Scenarios

structure of performances will also be taken into consideration, although this aspect requires further definition;

- **territorial** itineraries will centre on a specific city or region to examine its importance within the history of European music. These itineraries will present the local traditions, artistic practices, and social structures that shaped musical life, as well as the major venues that hosted performances. They will highlight the roles of musicians, patrons, and audiences, situating them within a broader historical, social, economic, and cultural framework. Attention will also be given to the genres and instruments cultivated in the area and to the impact of music on local society, including documented performances and their reception. The selection of venues will be based on their historical significance—for instance, as sites of patronage, premieres, or well-documented musical events. For each location, the itinerary will explore acoustic characteristics, recount notable performances, and examine the venue's role within the region's economic, political, and religious life. It will also consider the individuals who inhabited these spaces and the material and documentary evidence that attests to their importance. Questions regarding performance scale and concert formats remain to be clarified;
- **biographical** itineraries will focus on individual figures—composers, performers, or patrons—through the key places in which they lived and worked. Typically structured around four principal locations, these itineraries will examine the relationship between these individuals and their historical context, including their influence on music and other art forms. They will explore interactions between musicians, patrons, and broader social networks, as well as the significance of the places associated with them. Each itinerary will address the genres these figures cultivated, how their work was received by contemporary audiences, and the interpretative frameworks through which it may be understood today. For each location, attention will be given to acoustic properties, documented performances, and the presence of performers, patrons, and listeners. Documentary and material sources will play a key role in reconstructing the historical importance of these sites. As with other itinerary types, aspects such as performance formats and interpretative approaches require further specification;
- **site-specific** itineraries will highlight individual institutions—such as museums—that preserve materials relevant to the history of music. These itineraries will situate each institution within its cultural and social context, as well as within the wider urban or regional environment. They will explore the narratives embedded in the collections, including musical genres, historical documents, and performance traditions. The visit will be structured around specific rooms or sections, allowing for an in-depth engagement with selected objects and documents (letters, scores, music manuscripts). Particular

Design of Itineraries and Scenarios

emphasis will be placed on the historical and ceremonial contexts in which these materials were originally used, the impact of the preserved repertoires on past societies, and the individuals involved in their performance and reception. Through this approach, site-specific itineraries will illuminate how music history is curated, interpreted, and transmitted in the present.

The project also features a playful component aimed at engaging users in interactive activities exploring harmony, rhythm, and melody. This approach is conceived to be inclusive and accessible to all audiences, regardless of their physical ability or musical training (see WP4).

II.2.2 Storytelling Strategy in PlaceMUS XR

Storytelling is a core value of the PlaceMUS XR project, designed to make complex scientific concepts accessible to a broad audience. This aspect will be further developed through WP15 (Itineraries and Scenarios II: Storytelling). Storytelling allows the project to connect places, historical events, individuals, art objects, and music through the following communicative registers:

- 1) **documentary:** for those who cannot physically travel to the place, the itineraries will feature images of music venues as they are today, along with videos of historical reconstructions of musical events that took place there (including interviews with experts and artists);
- 2) **narrative:** voice-over or first-person narratives, imaginary reconstructions of the lives of historical figures, episodes from chronicles;
- 3) **imaginative:** historical soundscapes, objects presented as first-person narrators of their own stories;
- 4) **testimonial:** readings from original letters written by musicians or patrons, diaries, excerpts from musical or philosophic treatises, edicts and regulations related to musical performances in different ages;
- 5) **dramaturgical:** unspoken actions accompanied by music, portrayals of moments from the lives of musicians and their audiences in musical spaces.

These communication styles remain flexible and are tailored to suit specific contexts of use—such as museums, online platforms, and mobile applications—as well as the specific needs of various audiences.

A fundamental objective of the storytelling framework is to enhance an inclusive and universally accessible heritage. To achieve this, PlaceMUS XR tests and implements Generative AI tools to amplify accessibility. This AI integration is specifically utilized to adapt original scripts and content, ensuring that the narratives are accessible to diverse audiences (including children and non-expert visitors).

The **Story Map Building and Visualising Tool** (SMBVT) (R 01.7) will support the creation of a storytelling software for the itineraries, along with semi-automatic story

Design of Itineraries and Scenarios

maps built through semantic web. Narratives created with SMBVT are modelled on the narrative ontology, a tool developed by ISTI-CNR as an extension of three standard ontologies: CIDOC CRM, LRMoo and OWL Time. This narrative is represented as a network of geospatial and temporal events related by semantic relations. SMBVT is specifically developed to enable users without expertise in Semantic Web technologies to create narratives in an easy and semi-automatic way. In doing so, the tool provides a user-friendly interface following a User-Centered Design (UCD) approach, which accommodates the needs of users from various scientific domains.

II.2.3 Narrative Connection between Places

Each itinerary is conceived as a narrative pathway combining:

- place-based content providing information linked to specific musical sites and enabling interactive exploration of their characteristics;
- contextual content providing broader insights into the territory, infrastructures of different historical periods, the human and mobility aspects of travel, and the cultural and historical context. These elements help guide transitions from one site and the next. These narrative interconnections enrich the user experience by deepening contextual understanding through chronicles, historical accounts, or comparisons between musical traditions and practices; they also illuminate the human dimension of historical figures through letters, diaries, or other personal documents.

II.2.4 Gamification

Visitors can play with sounds and their cultural context through recognition and memory games, meaning association games, context reconstruction games, or movement games related to music. Examples of games may ask users to compare sounds, harmonies, styles, and musical traditions. Games can involve the creation of new itineraries, music co-creation, or the aggregation of sounds to construct a new musical composition.

In museums visitors can:

- interact with musical contents through motion-controlled interaction;
- contextualize exhibitions' content by interacting with a large map displaying the routes and places of music represented in the museum;
- impersonate a historical character to discover specific content about the places and objects of music.

The gaming framework can be used by curators with new personalized content to implement similar mini-game on different case studies.

Mini-games can be implemented as a complementary experience along the itineraries exploration.

II.2.5 Embodiment and Authenticity of the Experience

The concept of embodiment is concretely pursued by adopting the four approaches.

1) Immersive Spaces and "Soundwalking:"

- Virtual Reality (VR) immersion: the project develops tools, like the Web3D Presentation Layer, immersive VR, and AR to foster embodied multisensory experiences. Within these virtual environments, the integration of spatial forms, music, and ambient sound directly enhances the visitor's sense of embodiment and spatial awareness. These extended realities (XR) are specifically designed to deepen the user's understanding of how sound interacts with physical spaces;
- Phygital "Soundwalkers": visitors are encouraged to physically move and embody their experience by acting as "soundwalkers" who explore historical soundscapes in real-world locations;
- Ecological Sound AR: this physical exploration is supported by the Agami framework (a web application for Sound Augmented Reality), which employs open-ear bone-conduction headphones. This application allows users to maintain their natural, physical sensory connection to their real environment while simultaneously experiencing a digital acoustic overlay;
- participatory space of co-creation and interaction: the XR Presentation layer and the Metaverse allow users to interact and co-create content in shared virtual environments, where embodiment and active participation are key to meaningful experiences.

2) Physical and Gestural Interaction:

- Whole-Body Haptics: embodiment is physically achieved through the use of wireless vibrotactile devices, known as Haptic Bracelets. Users can wear these bracelets on their wrists and ankles to receive haptic pulses that guide multi-limb coordination. Users—including hearing-impaired individuals—will be able to feel and, in turn, learn rhythmic patterns;
- Traversing Harmony: the project employs spatial and gestural hardware and software to facilitate a physical engagement with musical harmony. It represents harmonic sequences as physical paths within a 3D space, enabling users to spatially traverse and interact with the music using their bodies;
- Tangible User Interfaces (TUIs): the project features a tangible interface that employs synesthetic strategies to make musical instruments' tuning and playing understandable through a multisensory experience.

3) Engaging Storytelling:

Design of Itineraries and Scenarios

- communicative registers: the project adopts a variety of communicative styles to engage diverse audiences (see paragraph II.2.2);
 - audio-visual integration: storytelling is brought to life through rich media integration directly within the 3D models and 360° panoramas;
- 4) Fundamental Research:
- contextualisation of historical soundscape and musical repertoires in original places of music: the user experience is enriched by multisensory solicitation and deeper understanding through audio diffusion, video-projections, holograms;
 - embodied cognition design: the design of these physical and digital interactions is heavily informed by expert research groups within the consortium.

II.2.6 Intersections and Semi-Automatic Generation of New Itineraries

Leveraging **semantic characterisation** of places and digital content, the project will enable the creation of intersections between existing itineraries and support the semi-automatic generation of new ones.

This process will be facilitated through the **GeoViz** module and the SMBVT tool, allowing thematic clustering (e.g., vocal music, polyphonic traditions) and dynamic recombination of content.

II.3 Scales of Representation of Musical Itineraries and Places

The PlaceMUS XR itineraries enable virtual exploration of indoor and outdoor locations, allowing users to experience musical performances in their original spatial contexts. As users move between different points of interest, navigation through space occurs simultaneously on a visual and acoustic level (POIs). Each POI is enriched with narratives, actions, characters, and objects.

This multiplicity of representational layers expands the ECCCH framework by developing tools managing heterogeneous datasets and supporting diverse interaction modalities. These experiences are structured around three complementary scales of representation and storytelling:

1) territorial scale: Geo-Narrative Exploration (based on Geographic Information System)

The first level consists of sites and routes presented in an interactive, georeferenced system that integrates spatial and chronological data. This supports comparative and analytical exploration across case studies. Users can interact with the map to find nearby locations or search by keywords.

2) interactive 360° panorama of places of music

D 3.1**Design of Itineraries and Scenarios**

The second level provides a 360° representation of musical sites, showing their current state and, where possible, their historical reconstruction.

360° panoramas—easily accessible through devices (OBJ-02)—will be extended with 1) time, 2) sound, 3) historical contexts, and 4) 3D objects. Contents can include movies, musical performances, 3D models, images, texts, and memoirs.

3) detailed 3D representation of places of music

This activity involves the creation of detailed 3D models of musical spaces, showing their current state and, where possible, their historical reconstruction. It consists of a spatial-acoustic simulation delivered through a VR environment with spatialized sound. Users can explore the relationship between space and sound through a fully immersive, multisensory experience (OBJ-04). Content will highlight the relationship between architecture and sound, how audiences perceived sound based on the musicians' location, and the emotional responses it evoked. In fact, the number of musicians, the types of instruments, musical genres, and tempo must adapt to the physical and acoustic properties of a given space. Similarly, makers designed instruments tailored to the acoustic characteristics of performance venues. Incorporating all these elements into the design of our itineraries will help raise public awareness of the relationship between acoustics and music-making at a practical and cognitive level.

The reconstruction of historical soundscapes will include not only structured musical performances but also the wide range of sounds that characterized those spaces. These contents will be integrated into the 3D models through:

- 1) 3D annotations (brief information linked to specific areas or sounds);
- 2) interactive 3D objects (e.g., musical instruments);
- 3) videos (e.g., live performances, interviews);
- 4) narrative storytelling elements.

Live performances in music sites by advanced music students and professional ensembles from the Consortium countries will be recorded using ambisonic microphones placed at key POIs. 3D models will be optimised at different resolutions and released in open, interoperable formats for access across multiple platforms and devices, including online. Source ambisonic files will be uploaded to the ECCCH, along with their renderings in open formats such as binaural and stereophonic. For an optimal listening experience, the use of headphones for binaural playback is recommended.

II.4 Sound Design, Acoustic Measurements and Spatialised Sound Reproduction in VR Experiences

The sound design in digital media can follow two different criteria: 1) psycho-acoustic approach, or 2) scientific acoustic simulation.

Virtual reality, videogames, cinema, and documentaries use their own established conventions to create realistic sound within simulated environments. These conventions help guide the user, enhance engagement, convey meaning, and evoke emotions. Rather than relying on precise physical measurements of sound, they are generally based on artistic choices aligned with psychoacoustic principles—focusing on how sound is perceived. In cinema and documentary, the sound supports the image rather than realistically representing the space. Levels, direction, and distance are often unrealistic (e.g., voices are clearer than they would be in real life), to be functional to perception and storytelling. Soundscapes, artificial or natural, are often created in postproduction.

Virtual reality (VR) is a three-dimensional digital environment designed to make users feel as if they are interacting with a real world through their senses. Within this space, users can move freely, observe from different perspectives, and continuously interpret what they experience in real time. Although it is technically possible to recreate sound with physical accuracy, most applications prioritize perceptual realism, relying on psychoacoustic techniques rather than precise scientific modelling of acoustic environments. Virtual reality & videogames use spatial audio techniques (e.g., 3D positioning, reverb, Doppler) but still rely on approximate and perceptual models. Sound is used functionally to guide the user, provide feedback, suggest meaning, and enhance immersion.

On the contrary, scientific acoustic simulation aims to recreate how sound propagates in the space thanks to real measures carried out through spatial acoustic acquisitions, sound sources, spatial and material properties, and listeners' position. Real-time physical simulation of sound requires a lot of computing power and resources that are expensive and difficult to run efficiently.

A common solution in VR environments is to precompute sound at fixed spatial points and interpolate between them, despite some loss of precision in the intermediate areas. Furthermore, acoustically simulated sound does not always provide a satisfactory experience for users, especially when the original acoustics are poor or the listening conditions are suboptimal.

As such, the question raises: under what conditions is the scientific simulation of an acoustic space preferable to the more common paradigms of psychoacoustics?

In immersive VR, spatial acoustic acquisition is particularly valuable in spaces such as cathedrals, theatres, and concert halls, where sound is an essential part of the

experiential and ritual dimensions, and where architecture itself functions as a monumental resonant instrument.

Immersive VR enables sensory engagement with a musical site's acoustics, deepening understanding of the significance of ritual musical practices and repertoires through embodiment.

II.5 Integration of Musical Recordings

Musical and performative content will enrich musical sites in virtual scenarios, realised through:

- the collection of existing archival resources;
- the recording of live performances.

Alongside professional ensembles from partner countries, advanced music students from conservatories and music schools will participate as performers, dancers, or actors in musical spaces. Their performances will be recorded using ambisonic microphones placed at key points in space, as well as professional film cameras and 360° cameras.

Partners will organise workshops and initiatives to connect artists, educators, and music students with the PlaceMUS XR community and facilitate exchanges on the project's objectives, methodologies, outcomes, and impact.

Active participation will enhance the visibility and prestige of educational institutions. It will also raise young artists' awareness of ECCCH-related initiatives and connect them with research institutions and creative industries at the European level. In addition, they will be able to use the tools and datasets developed by PlaceMUS XR to explore and strengthen their understanding of the fundamental relationship between sound and space in musical practice.

II.6 Digitisation, 3D Representation, and Interaction Paradigms

The digitization of music venues must adhere to methods and criteria that are as standardized as possible while maintaining high quality. This process must take into account the potential of currently available professional technologies, the heterogeneity of the materials housed in museum collections, and the need to manage resources in real-time interactive environments across a wide range of devices. The

Design of Itineraries and Scenarios

levels of detail in the 3D representation must necessarily be diversified to accommodate various accessibility requirements.²⁵

The 3D digitization and representation techniques, together with their interaction paradigms, will be tailored to the itineraries. The process starts in WP3 and is completed in WP7.

The following tables summarize the potential methods, as well as the benefits and limitations of each.

II.6.1 360° Panorama

Example: https://www.map.cnrs.fr/placemus/gallery/tyniec_gallery.html

Interaction	1) showing the present context and, where possible, its past reconstruction; 2) looking around, zoom on details; 3) creating interactive elements through semantic masks; 4) extracting 3D objects from the panorama features; 5) putting 3D objects in foreground; 6) including audio storytelling, and musical repertoires; 7) sound reproduction based on the acoustics properties of the real space acquired from the same position; 8) audio transition along the 360° exploration; 9) a place can be represented through more than one connected 360° panorama;
Advantages	360° panoramas are a long-established type of visual representation, widely used in virtual tours, easy to manage on personal devices, accessible and usable by everyone. In PlaceMUS XR, they will be integrated with new functionalities conceived to add 1) time; 2) sound; 3) 3D dimensions. They can be visualised on any device, including immersive VR. Standardized formats. ATON and Minerva can implement 360° interactive panoramas. Benefits exist also in terms of time costs;
Criticalities	1) it is not really 3D, it is not a measurable space, free exploration of space is not allowed; 2) impossible to include dynamic elements in the 360° panoramas; 3) difficulties in including animation; 4) very limited possibility to interactively edit the scene (e.g. improving light, colours); 5) impossible to move objects or interactively modify the lights.

II.6.2 360° Panorama with Depth Map

Examples:

- THREE.js egocentric depth-map:
<https://www.youtube.com/watch?v=EBCszLDNtS4>;

²⁵ Guidelines for the 3D Digitization of historical, artistic, and archaeological movable museum objects, published by the Digital Library of the Italian Ministry of Culture, in collaboration with CNR ISPC and CNR ISTI: <https://partecipa.gov.it/processes/Linee-Guida-Digitalizzazione-3D>.

Design of Itineraries and Scenarios

- Video (DPF): <https://www.youtube.com/watch?v=EBCszLDNtS4>.

Interaction	Same as above, but with depth perception
Advantages	1) same as above, but with better spatial depth perception for immersive experience using stereoscopic Head Mounted displays (HMDs); 2) it impacts minimally at rendering times thus could be very effective also on limited devices; 3) ATON can implement 360° with depth maps through underneath THREE.js support;
Criticalities	to provide correct scale and egocentric distances, laser scanner acquisition is needed to produce correctly encoded depth maps.

II.6.3 Detailed 3D Model Derived from Spatial and Acoustic Acquisition

Example: 3D scene available in ATON collection: <https://aton.ispc.cnr.it/s/vhlab/sid-ac9lddw5w>

Interaction	1) showing the present context and, where possible, its past reconstruction; 2) free exploration of the space; 3) 3D annotation of the model; 4) spatial-acoustic simulation accessible through VR environment with spatialized sound; 5) possibility to integrate in the 3D space musicians and audience positions, and the whole setup to arouse specific emotions in the audience;
Advantages	1) the model is described by a measurable mesh geometry 2) free exploration possible, improved immersive multisensory experience, possibility to create annotations; 3) better comprehension of the relation between sound and the simulated space; 4) possibility to introduce animations and dynamic elements in the scene; 5) possibility to edit and move the light, modify the scene; 6) possibility to include characters or people recorded in Green screen; 7) possibility to include multimedia. Standardized formats and metadata models available; 8) ATON and Minerva can implement such complex 3D environments with any device; 9) completely open-source pipeline available;
Criticalities	1) long time needed for digital documentation (through photogrammetry or laser scanning) and data elaboration and optimization; 2) data are heavier and demanding in terms of performance of devices; 3) people may need assistance during interaction.

II.6.4 Gaussian Splatting (3DGS)

Light field rendering is an emerging area of research that uses sets of static images to represent a scene as it appears from different viewpoints, without generating an explicit 3D model. Gaussian splats are a way to represent a 3D scene using many

Design of Itineraries and Scenarios

small, blurry **blobs** instead of traditional polygons or **voxels**. This type of representation can, in some contexts, be an alternative to representing a place as a mesh model. The input data still consists of photographs, which are initially oriented in the same way as in standard photogrammetric digitization.

Same public 3DGS accessible on ATON:

- <https://aton.ispc.cnr.it/?q=3dgs;>
- <https://aton.ispc.cnr.it/s/dronchi/20260323-e1c99101f719>.

Interaction	1) free exploration of the space at its present condition (not applicable to virtual reconstructions of the past); 2) Integration of semantic annotations alongside 3DGS; 3) inclusion of 3D objects models obtained through traditional acquisition methods; 4) inclusion of sound in the exploration: audio stories, musical repertoires; 5) sound reproduction based on the acoustics properties of the real space acquired on site;
Advantages	1) fast acquisition with high quality of the result; 2) promising technology within volume rendering techniques. Possibility to represent very complex contexts and materials, including glass, mirrors; 3) SLAM may lead to better results; 4) ATON can implement Gaussian Splats through common Web3D formats;
Criticalities	1) no measurable geometry described by polygons; 2) 3DGS are volumetric representations (i.e., illusions); 3) no light editing is possible; 4) getting close to a surface rendering quality is lost; 5) lack of a standardised pipeline, rapidly evolving technology with still ongoing standardization, impacting re-usability of data; 6) production pipeline can include multiple open or proprietary tools; 7) training of 3DGS can be computationally intensive on GPUs and adds up to the overall processing times; 8) within Web3D scenarios, 3DGS have a strong impact on rendering performances, especially on mobile or limited devices; 9) WebXR presentation still raises additional challenges in terms of acceptable framerates, when accessed with standalone HMDs and millions of gaussians; 10) as a rapidly evolving technique, there is a risk of obsolescence; 11) levels of detail could be explored, but there is no standardization yet;
Additional Comments	1) this technique is very recent and still experimental; 2) it will be interesting to test in PlaceMUS XR beside traditional digitisation techniques; 3) a protocol to document the acquisition and post-processing process is needed.

II.6.5 360° Video

Example: 270° Video to be visualised on physical wide screens and in webXR
<https://cloud.ispc.cnr.it/s/m9CjDRFSbYf4jma>

Design of Itineraries and Scenarios

Interaction	1) showing the present context; 2) create interactive elements through semantic masks (if the video is recorded from a fixed position); 3) including sound in the exploration, audio stories, musical repertoires, and live musical performances recorded on site; 4) sound reproduction based on acoustic properties recorded from the same position in the real space; 5) a place can be represented through more than one connected 360° video; 6) the 360° camera can record dynamically, while moving across the space;
Advantages	1) fast documentary video techniques and high-quality video documentation; 2) easily accessible; 3) ATON can implement and play 360° video;
Criticalities	1) no 3D model acquired; 2) limited interaction.

II.6.6 3D Objects from Photogrammetry

Example: <https://aton.ispc.cnr.it/s/dronchi/20260331-1df2de7633ef>

Interaction	1) present and interact with objects from a musical site to support deeper understanding; 2) objects integrated into a 3D architectural scene through ATON or presented alone in a dedicated 3D scene where the users can rotate/zoom the objects, eventually mapped with semantic annotations;
Advantages	1) easy to create; 2) technology is already known; 3) easy to optimise and visualise in ATON;
Criticalities	1) this technique is not suitable for all real objects, particularly those with glass or other transparent materials; 2) for transparent materials, Gaussian Splatting technique is better.

II.6.7 Spatial Room Impulse Responses (SRIR)

Example: <https://anr-sesames.map.cnrs.fr/convolveur2/index.html>

Interaction	1) multichannel audio data which characterize acoustic behaviour of a closed space (i.e. rooms); 2) it represents the sound propagation between a sonic source (e.g. a loudspeaker, a musical instrument) and a receiver (e.g. spatial microphone, listener hears), including direct sound path as well as sound reflections and scattering on the room boundaries; 3) can be either measured or simulated and provide objective insights of acoustic properties of a space; 4) can be used for recreating/auralizing immersive virtual acoustic environments;
Advantages	core material for immersive auralization of virtual acoustic environments;

Design of Itineraries and Scenarios

Criticalities	1) requires on-site data acquisition strategies and specialised equipment (preferably the same in various places, for comparability reasons).
---------------	---

II.6.8 Recorded Soundscape

Examples:

- https://anr-sesames.map.cnrs.fr/sound_annotation_site/index.php;
- <https://anr-sesames.map.cnrs.fr/convolveur2/index.html>.

Interaction	1) audio recordings of a place's sound ambience; 2) the recordings cover both interior and semi-exterior environments and include both punctual recordings and time series; 3) recordings will be taken from different locations inside the buildings; 4) recordings will act both as material for abstract visual storytelling material and as components of a multisensory platform;
Advantages	recordings allow users to perceive and better understand the distinctive characteristics of each place;
Criticalities	these recordings capture specific moments and should not be taken as representative of the place's general soundscape.

II.6.9 Multidimensional Icons and Earcons

Multidimensional icons and earcons are audiovisual cues that combine visual symbols (*icons*) and structured sounds (*earcons*). They can be seen as teasers before delivering heterogeneous information sets. They act as an entry point into various complex digital environments, each of which building on subsets of the Information and multimedia content gathered to document sites.

Example: https://territographie.map.cnrs.fr/parcours/index_parcours.html

Interaction	allowing playful, cognitive experiences where users interpret abstract signs without the use of ethnic languages;
Advantages	1) providing synthetic overviews of a place's feature; 2) providing a symbolic audio and visual signature of place; 3) facilitating direct comparisons between sites, especially on maps;
Criticalities	1) impossibility to replace a storytelling approach; 2) implying a learning curve (an explanation of the rules behind the sign, i.e. legend).

II.7 Integration of Musical Itineraries into ECCCH

PlaceMUS XR tools support the 1) creation, 2) visualization of scenarios, and 3) multisensory interaction with musical places heritage sites, at school, along existing cultural itineraries, and at home. Some of these tools derive from pre-existing research, but they will be expanded with new functionalities. Designed for diverse

Design of Itineraries and Scenarios

audiences and contexts, they must prioritise accessibility, inclusivity, and ease of use, especially for users with limited technical resources tools and datasets will be integrated into the ECCCH and made available online for reuse in museum installations, including holographic showcases, immersive kiosks, video projections, and sound-based AR. Content will be streamed on site or made downloadable, even in low-connectivity environments.

The **GeoViz web module** (R 01.1) allows users to interactively explore cultural routes through maps that combine visual, sonic, and time-based elements, along with semantic analysis, to better understand musical heritage sites. Developed by the CNRS MAP Laboratory, its graphic interface combines cartography, chronography, and “visual formalisms” based on the methodological legacy of the **InfoVis** (Information Visualization community platform) discipline.

The **Web3D Scene Editor framework** (R 01.2) enables the creation of responsive, adaptive, and scalable web-based 3D presentations, including 360° panoramas and detailed models with spatial-acoustic simulations and multimedia content. It will be used to help Cultural Heritage (CH) professionals create interactive scenarios by drawing on the PlaceMUS XR case studies. Authenticated users will be able to: 1) create a new scene; 2) import and position 3D objects (even animated ones) and audio files; 3) create annotations; 4) create and move lights; 5) associate links to objects in the scenes; 6) create cameras and navigational constraint as pre-defined viewpoints; 7) upload, modify, and save scenes. The overall framework design is conceived to be modular, easy to use, and interoperable. It allows the creation of Web Apps accessible through standard browser resulting in a single, *cross-device* product. These will be available for every device, without any installation required for the users. The already-existing open-source framework ATON (<http://aton.ispc.cnr.it/site/>) will be customized and integrated with the functionalities of the **MINERVA** and **ART4SEA** frameworks, developed by 3D Research (<https://www.3dresearch.it/en/heritage-en/projects-section/minerva-en/>).

The framework’s **Client-side Presentation Layer** (R 01.3) will employ open-source 3D libraries and modern standards (e.g., Web XR) to deliver rich, immersive 3D experiences to users. It supports: 1) multitouch interfaces, **Spatial UI**, built-in navigation modes, 3D **semantic annotations**, and **WYSIWYG** rich annotation editor in HTML5; 2) fast, real-time 3D queries on semantic graph and UI nodes; 3) Built-in profiler (appropriate for different devices); 4) immersive VR for *3DOF* and *6DOF* devices; 5) 360° panoramas, advanced multi-texturing and PBR; 6) advanced lighting; 7) measurements tools; 8) real-time synchronous multi-user sessions allowing multiple users to meet in the same virtual environment and cooperate. Users can access the Presentation Layer through a public or editor profile. Public profiles allow to explore and query existing scenarios, while editor profiles grant authenticated users to create new contents. The presentation layer will be managed by ATON with integrations of MINERVA and Unity 3D. Unity 3D can be employed for specific implementation,

Design of Itineraries and Scenarios

such as stand-alone immersive VR and integration with specific hardware devices, including haptic interfaces and Tangible User Interfaces (TUI). MINERVA will support AI-based approaches to create mini-games on sound recognition and memorization, perception, rhythmic performances, motion-based interaction connected to musical performance.

The **VR and AR tools On the Move** (R 01.4), based on the Web3D Scene Editor framework, integrate geo-localization and specific GUI to better support users' access to real places. These tools allow user to access, explore and interact with digital content anchored to physical location. On the Move represents the mobile extension of the Web 3D Presentation Layer to extend the museum experience beyond physical walls and transform places into open-air museums. These tools support Sound Augmented Reality (R 01.6), enriching the user involvement through a fully immersive audio experience, as described later.

The **Immersive Analytics Web Services** (R 01.5) allows to capture, process (specifically through Machine Learning algorithms), and inspect user' experiences with 3D environments. Developed by CNR ISPC (<https://interlumo.ispc.cnr.it/>), the service can be applied on both online single-user and online multi-user synchronous collaborative sessions (<https://interlumo.ispc.cnr.it/>).

The **Sound Augmented Reality** (AR) tool (R01.6), based on the Agami platform, will enable users to immerse themselves in reconstructed historical soundscapes of both indoor and outdoor spaces—including sites that no longer exist but are documented in historical sources and early city maps—while moving through real-world locations. The 3D audio experience is supported by a geolocalisation interface. Voices, sound, and music are accessible through a Web App (downloadable through a QR code) that can be used while approaching POIs. Developed by Mezzo Forte (<https://mezzoforte.design/agami?lang=en>), this tool is designed for an immersive, ecological Sound Augmented Reality experience, where visitors keep their natural sensory interaction with the environment. This is achieved by a new **phygital** way to listen to reality, using open ear bone-conduction headphones (<https://mezzoforte.design/agami?lang=en>).

Story Map Building and Visualising Tool (SMBVT) provides maps, texts, images, and audio files to create geolocated story maps. By making all collected data accessible in line with FAIR principles and the Linked Open Data paradigm, these tools support the automatic generation of knowledge graphs based on user-created narratives.

Future developments include: 1) interactive 3D object integration with annotations (via ATON); 2) extension of the Narrative Ontology for 3D model representation; 3) exclusion of map from the event when unnecessary, 4) integration of an open-source Large Language Model (LLM) for generating narrative events from plain text, thus ensuring integrity and allowing users' modifications.

Design of Itineraries and Scenarios

The Open University Music Computing Lab has developed tools that let users with little or no musical training explore harmonic movement as spatial journeys that can be heard and seen, while also offering insights for musical experts. Specifically, [Harmony Space](#) enables harmonic relationships to be represented as 2D spatial phenomena such as trajectories (fig. 4). When users move through the space, they hear the sounds corresponding to the different locations. Our working hypothesis is that providing proprioceptive guidance around Harmony Space will improve musicians' knowledge of larger scale harmonic elements such as chord progressions and thereby improve their improvisation skills.

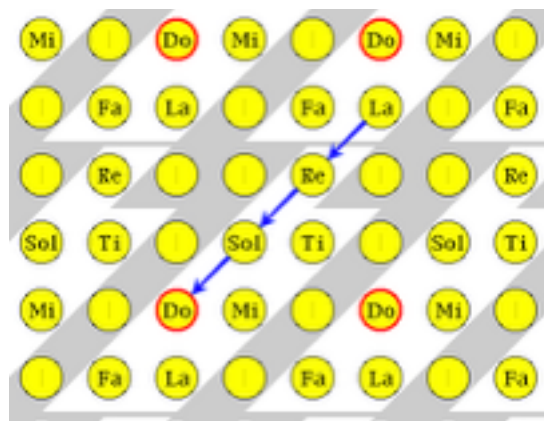


Figure 4. Stevie Wonder *Isn't she lovely* (1976).

These tools allow anyone able to use a joystick (or an equivalent assistive device) to quickly learn to play with precision the chord sequences of well-known songs, modify them, or create new ones. In doing so, even people with severe physical impairments can explore and compose harmony as they wish—on their own, with recorded music, or as equal participants performing alongside experienced musicians.

A **set of accessibility tools** (R06.3, R06.4, R06.5) provides methods to foster deep and lasting engagement, offering visitors active and playful ways to interact with music. These experiences are designed to be accessible to all, regardless of sensory or physical disabilities or prior musical experience.

These tools build on research conducted by OU's Music Computing Lab in the context of the Polifonia project, as well as by CNR ISPC and CNRS, and include:

- 1) haptic tools for accessible engagement with rhythm in museum contexts (including people with hearing impairments);
- 2) gestural tools for accessible engagement with harmony in museums (including people with motor impairments);
- 3) tools for synesthetic single and multi-user experiences with tuning (including people with hearing impairments);
- 4) the action "Multisensory, representation of information sets" built on:
 - 4.1) visual mapping of acoustic data (from sound to graphics),
 - 4.2) acoustic mapping of visual data (from architecture, history, context to sounds).

II.8 Itinerary Interface

The digital journey across the musical itinerary is designed and structured as follows.

II.8.1 Introductory 3D Space

Users begin their experience in a cosmic 3D space, where a globe is positioned at the centre, oriented so that Europe faces upwards.

The globe displays the nine itineraries from which users can choose. The itineraries are represented on the globe through coloured free-form 3D graphics resembling sound waves. In addition, each itinerary has a label containing its title, designed to resemble a postcard. In this way, the user can immediately understand the itineraries' main content and geographical location (fig. 5).

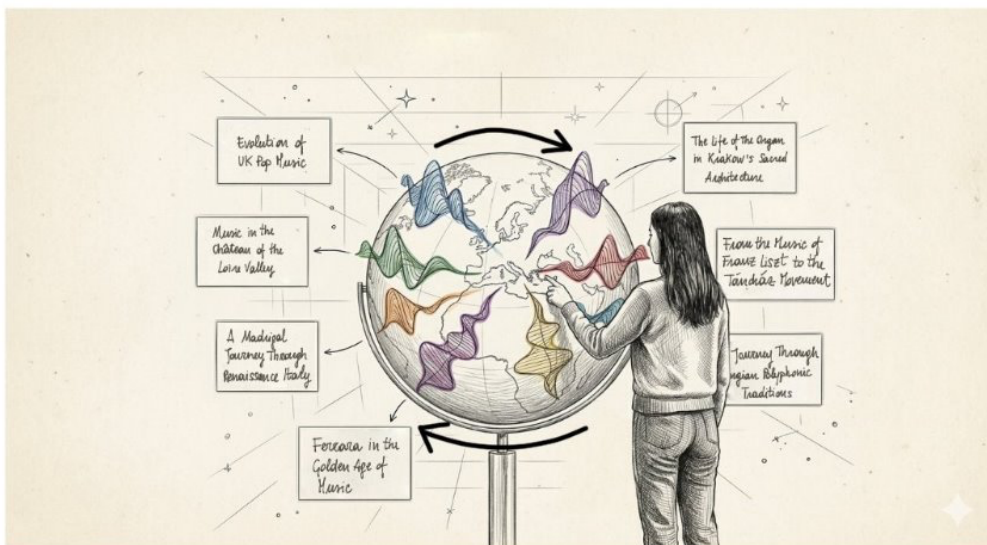


Figure 5. Conceptual draft of the Introductory 3D Space (AI generated image).

Users can select an itinerary and access preliminary information to help guide their choice. To improve accessibility, this very brief information is provided both in textual and audio form. Moreover, selecting an itinerary will activate a background sonic imprint connected to the selected itinerary.

If the user is satisfied with the choice, they may proceed by entering the selected itinerary; otherwise, they may select another itinerary until they find the one they wish to explore in greater depth.

II.8.2 Itinerary Overview

Once the itinerary selection is confirmed, the user is transported into a new scenario. Conceptually, this new space represents a metaphor for the hybridisation between cosmic space and sonic space (stars, planets, and sound waves).

Phase 1 – Itinerary Presentation

Within this space, the itinerary is initially presented to the user through an animation lasting approximately 1 minute (stars and planets have not yet appeared; only sound waves are present in the space).

The itinerary is presented through an image projected onto a long horizontal strip that scrolls automatically (a predefined real-time animation). The strip is positioned within the cosmic space containing the sound waves.

The video is accompanied by a spoken narrative audio, together with an evocative soundscape associated with the itinerary. To improve accessibility, the spoken narration is also available in written form: the text appears beneath the scrolling strip and moves along with it (fig. 6).



Figure 6. Conceptual draft of the itinerary presentation interface (AI generated image).

Phase 2 – Choice of User Identity

Once the itinerary presentation is completed, the user may decide whether to configure their journey with the suggested stops based on their interests, or to explore the entire itinerary without any particular filtering.

This choice is made through the selection of a character with whom the user decides to identify (fig. 7).



Figure 7. Conceptual draft of the choice of user identity (AI generated image).

As an additional option, the user may choose to explore an itinerary using the Geoviz module specifically tailored to a given itinerary.

The previous video is replaced by a canvas displaying three/four different characters for each itinerary. The characters are represented through cards which, when selected, display the main characteristics of the journey that the user would undertake in the role of the selected character (interests, encounters, places, and preferred content).

The characters guide the journey according to different target audiences, for example:

- children;
- users with expertise in music/musicology;
- users with expertise in architecture/acoustics/sonic spaces;
- users with expertise in art collections;
- users with expertise in data analyses and comparative studies.

Therefore, each itinerary must include at least three characters, although there may be more if specific needs arise.

The characters could include:

- a musician;
- an architect;
- a high-society collector;

Design of Itineraries and Scenarios

- an artist/craftsman;
- a geographer;
- a child.

Men and women will be represented in equal numbers.

The character selection must be carefully evaluated, since they serve as filters for the content.

If the user chooses to navigate through GeoViz, the entire itinerary experience will take place through the dedicated interface used for activating and exploring the contents.

Once a character is chosen, the itinerary is configured to present content aligned with their presumed interests, adjusting its priority and prominence.

If the selected character is a child, the type of language also changes.

This allows the users to encounter different contents within the itinerary each time it is explored, therefore encouraging them to repeat the experience with a new character.

It also makes it possible to organise and manage the quantity and variety of contents within each itinerary, further thematising it.

In principle, semantic segmentation of the content would allow new characters to be created in the future by recombining content on the backend.

II.8.3 Journey Through the Itinerary***II.8.3.1 Spatial Structure of the Itinerary***

Once the user has chosen the mode of exploration, the character-selection cards disappear and is replaced by sound waves forming graphic narrative structure.

This consists of a 360° three-dimensional sound wave surrounding the user (fig. 8).

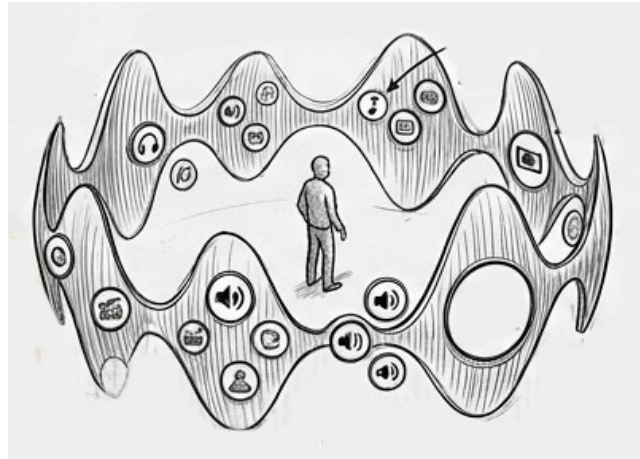


Figure 8. Conceptualisation of the sound wave as the graphic narrative structure.

Hotspots are embedded between the curves of the sound wave to provide access to the itinerary content. These are represented as circles containing an icon/image (fig. 9).



Figure 9. Conceptualisation of the spatial configuration of the itinerary (AI generated image).

Hotspots are grouped into clusters according to their theme and mutual relationships (for convenience we refer to these clusters as “constellations”).

The size of the hotspots varies as follows:

- the hotspots corresponding to the places of music are the largest (for convenience we call them “planets”);

Design of Itineraries and Scenarios

- the hotspots corresponding to the main contents are smaller (for convenience we call them “stars”);
- second-level contents (which we call “satellites”) may be arranged around the star or the planet.

In terms of working nomenclature (only for editors):

- hotspots = all interactive elements within the cosmic space;
- constellations = clusters containing a hierarchy of contents;
- planets = places of music;
- stars = main first-level contents;
- satellites = second-level contents.

When the user does not approach any constellation, the soundscape is confused and undifferentiated, ideally representing the fusion of all sounds without tuning.

II.8.3.2 User Interaction in the 3D Space – Choosing a Constellation

When the user approaches a constellation interactively within the cosmic space, the sound wave deforms and expands around that constellation. After that, a spatialised sound emerges near it.

If the user selects any hotspot icon (star or satellite), they access the associated content, which may be audio, video, image, or a 3D object.

The level of importance of the content (star or satellite) is suggested graphically, but the user is free to move among them without constraints.

Once the content ends, the interface fades to black.

The corresponding light in the cosmic space can change colour to indicate that the content has already been viewed.

If users select the hotspot corresponding to a place of music, they can proceed to the stage described in paragraph II.8.4.

If the user does not select a character at the beginning of the journey, the itinerary space will contain the complete itinerary with all available contents. Otherwise, as mentioned above, if the user selects a character at the beginning of the journey, the itinerary space will contain only the itinerary associated with that specific character.

II.8.4 Places of Music

The places of music are special hotspots providing access to additional virtual spaces, either in 3D environments or in virtual tours with 360° panoramas.

Upon entering the place, the user is presented with a series of questions that may appear as a menu (fig. 10), for example:

- where am I?
- What can I do?
- Where can I go?
- Who can I encounter?
- What should I look for?
- How much time will this visit take?

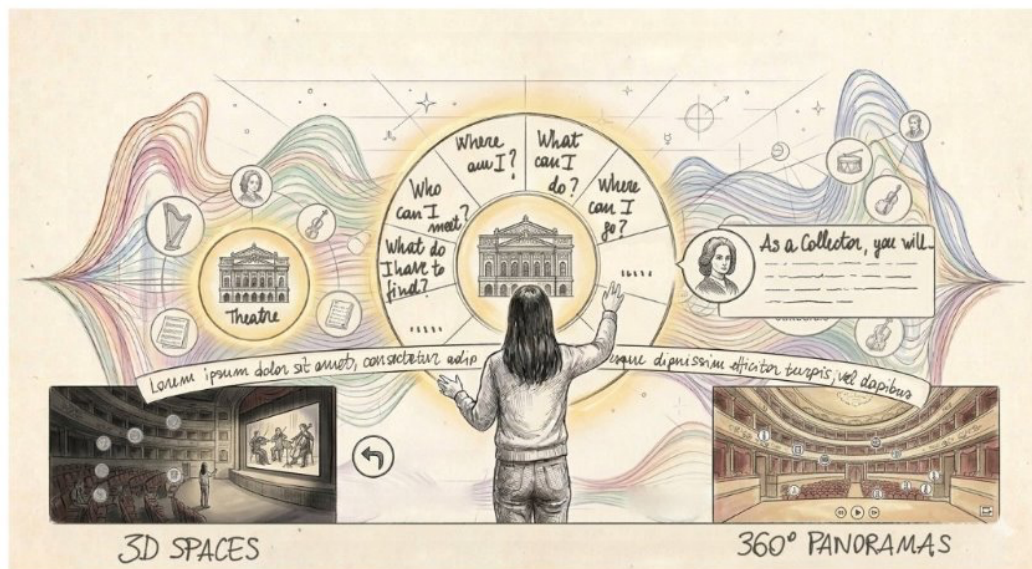


Figure 10. Conceptualisation of the interface when entering in a place of music (AI generated image).

At this point, the user may begin exploring the place of music (3D or 360°) and interact with the semantic annotations embedded in the environment, which deepen the themes introduced by the questions and answers.

In each 3D room or 360° panorama, there is a portal allowing the user to return to the 3D itinerary space.

II.8.4.1 Types of Content in the Place of Music

Places of music present two types of content.

- 1) Content that can be contextualised within the virtual place through:
 - introductory audio descriptions of the space;
 - musical repertoires;
 - specific annotations on the 3D model.

Design of Itineraries and Scenarios

If the content involves listening to a musical repertoire, the environment becomes dimly lit and interaction with annotations is temporarily disabled to encourage concentration on the listening experience.

2) Additional content may appear outside the 3D environment, featuring:

- videos of musicians performing a piece associated with the location;
- relevant objects, presented in a dedicated 3D scene.

Once these contents are completed, the user automatically returns to the place of music or may do so via a “back” button.

II.8.4.2 GeoViz Integration

The GeoViz module combines a core cartographic component with additional layers of information presented as overlays or tabs (inside a common web app) dedicated to temporal data, contextual data, and to the structuring of external resources.

The primary role of the cartographic component is to distribute information spatially to help users get a global view of the position and organisation of the main sites of an itinerary (and when relevant of hotspots). Additionally, it offers a synthetic overview of the main sites’ features, enabling users to compare them and identify similarities and differences at a territorial scale.

Overlays will be used to present different types of information over time, with a graphic design (visual metaphor) in line with the general choices described in the report. Thanks to these additional layers, the various datasets (e.g., 3D models, videos, sounds) produced or compiled within PlaceMUS XR will be made accessible via external URLs. This will minimise technical dependencies, reduce maintenance costs, and facilitate reuse of the module. As such, the module can serve as a portal giving access to site-specific heterogeneous content.

The module will take the shape of a toolbox allowing actors in charge of the Itineraries to tailor, configure, and feed the content to be presented.

The geovisualisation solution is grounded in representing, accessing, and interpreting spatial, temporal, and other relevant data for analysis and comparison. In many cases, interconnected visualisations will be produced, each addressing a specific question about the data, rather than functioning as simple route planners. Hence, the primary issue is the data model, that is, the choices involved in translating ‘features’ (e.g., size, type, name, age) into usable data. These choices are far from self-evident and have significant consequences.

To this end, a data model has been issued and published in the PlaceMUS XR’s Teams repository. The data model is designed to serve the project precisely by adopting an appropriate level of granularity—including in the choice of data types—

D 3.1

Design of Itineraries and Scenarios

that can support a variety of case studies and itineraries. The information's availability, consistency, and reliability are critical issues when trying to design a platform meant to be sharable and reusable.

The data model identifies three parameters:

- mandatory elements: main components of the multidimensional icon displayed on the cartographic component for each main site (e.g. geographic coordinates);
- optional elements: additional components that can be included in the multidimensional icon without affecting the readability and consistency of the multidimensional icon);
- overlay elements: data and information not shown on the cartographic component but displayed in overlays, some of which link to external URLs.

Each parameter features:

- name;
- type;
- content (the nature of the data);
- main choice (point of view);
- comments (context, pros and cons).

From a technical standpoint, the module builds on standards for online, open-source visualisation of geoinformation (OSM / leaflet / geojson). The goal is to privilege low maintenance costs, robustness, easiness of use (learning curve), and digital sobriety.

The Geoviz module will use the case study *Organs, Sacred Architecture, and Urban Soundscapes in Krakow* to experiment with, fine-tune, and evaluate its added value and technical challenges. This choice balances a generic solution for PlaceMUS XR case studies with the specific context of Krakow, which will serve as the training ground for the module.

II.8.4.3 Onsite Open-Ear Audio-Augmented Tour - Agami

Users visiting the itinerary onsite can choose the audio-augmented audio tour with Agami (<https://agami.mezzoforte.design/>) Selected hotspots are associated with audiovisual contents (one per hotspot). Contents are activated by triggers provided by GPS automatic localization, **NFC tags**, or other manual triggers, such as QR codes. To ensure a high-quality and ecologically sound experience, users should be equipped with open-ear, bone-conduction headphones. These allow them to listen to the tour content while remaining aware of the surrounding acoustic environment.

On smartphones, experience scenarios can include the following:

Design of Itineraries and Scenarios

- users access the mobile version of PlaceMUS XR Virtual Museum and enter Phase 2 – Itinerary Overview, skipping the itinerary selection step;
- after Phase 2 – Choice of User Identity (or no identity chosen)—the overview displays the Agami card;
- if users select the Agami card, the view switches to the corresponding map;
- users can go back to the PlaceMUS XR Virtual Museum with a dedicated button.

The integration of Agami in the PlaceMUS XR Virtual Museum may follow different strategies:

- URL of the Agami route web app;
- integration of the Agami core libraries within the PlaceMUS XR Virtual Museum app.

II.8.4.4 Integration of SMBVT and Story Maps as Narrative Stars

Within the PlaceMUS XR conceptual model, the outputs of the Story Map Building and Visualising Tool (SMBVT)—namely, the story maps—constitute the core narrative units experienced by users. Within the interface’s cosmic metaphor, these story maps can be conceived as “stars” in the musical universe of PlaceMUS XR.

Each star (story map) represents a structured narrative composed of geospatial and temporal events, semantically interconnected, and organised around specific themes, places, or viewpoints. These narrative units populate the constellations of the itinerary.

From a technical standpoint, SMBVT is an open-source web tool for creating narratives based on Semantic Web technologies. Narratives are modelled using the Narrative Ontology (extending CIDOC CRM, LRMoo, and OWL Time) and represented as networks of semantically linked events. The tool supports semi-automatic narrative creation through a user-friendly interface, enabling domain experts—even without specific Semantic Web expertise—to build structured story maps. A such, SMBVT can serve as an authoring and knowledge-structuring environment that supports experts in creating narrative content.

The contents of the story maps are made available as knowledge graphs, following the Linked Open Data (LOD) paradigm and complying with the HDTO (Heritage Digital Twin Ontology) developed within the ECHOES project. This ensures interoperability, reusability, and long-term sustainability of the data, as well as alignment with broader European digital heritage infrastructures.

These story maps can then be exported or integrated into the PlaceMUS XR system as modular content units. Once imported, they become interactive hotspots (stars) within the 3D environment, accessible via the immersive interface.

Design of Itineraries and Scenarios

In this way, SMBVT functions entirely at the back end as a tool for narrative construction and knowledge graph generation, while the front end presents only the resulting outputs. Users do not interact with SMBVT itself, but with the story maps it produces, experienced as part of the spatialised, sonic, and visual narrative ecosystem.

Additionally, SMBVT can support the generation of alternative outputs such as printable versions of the narratives (e.g., PDFs or web pages), ensuring accessibility for users who prefer non-immersive experiences. These outputs may include links or QR codes to access multimedia content within the PlaceMUS XR environment.

This separation between authoring tool and user experience ensures both scientific robustness in content creation and clarity and immediacy in user interaction.

II.9 Dataset Standardisation

Dataset standardisation is a fundamental step for the development of digital itineraries which will include video, images, and music. This material should follow the FAIR Principles and CARE Principles. According to FAIR, content must be 1) Findable (described with structured metadata and persistent identifiers), 2) Accessible (available through interoperable platforms and open protocols), 3) Interoperable (based on standard formats and shared vocabularies), and Reusable (accompanied by clear licences and contextual documentation). At the same time, the CARE (Collective Benefit, Authority to Control, Responsibility, and Ethics) principles emphasize the ethical and cultural dimensions of data. Applied to museum itineraries, these principles imply the creation of integrated and coherent datasets in which video, images, and audio tracks are uniformly described, interconnected, and contextualised to support both technological use (XR, AR, web platforms) and a conscious, respectful engagement with musical and cultural heritage.

From an operational perspective, it is necessary to define standardised and sustainable formats for each type of content. For video, the use of MP4 (H.264/H.265 codecs) is recommended for distribution, alongside high-quality or lossless formats (e.g. MOV, ProRes) for archiving. Images should be stored in high-resolution TIFF for archiving purposes and made available in JPEG/PNG formats; for 3D objects and immersive environments, formats such as glTF/GLB or OBJ are preferable. To preserve audio content, it is advisable to distinguish between WAV or FLAC, and easily accessible through MP3/AAC. These should be complemented by structured formats for representing textual and musical content, such as TEI for encoding texts (written sources such as treatises, librettos, letters) and MEI for digital music notation, both essential for ensuring interoperability, analysis, and scholarly reuse. All files should be accompanied by standard metadata (e.g. METS, IIIF, schema.org, SKOS thesaurus) and persistent identifiers, ensuring compatibility with XR technologies and long-term sustainability.

These technical and ethical considerations take on a specific institutional dimension within PlaceMUS XR, where dataset standardisation is directly tied to the integration requirements of the ECHOES framework. All assets produced by the project must be contributed to the European Collaborative Cloud for Cultural Heritage (ECCCH) in line with the Common European data space for cultural heritage and in compliance with open science principles.

This integration imposes concrete constraints on the choices made upstream. Resources from different partners must comply with a shared knowledge base built on standardised metadata and knowledge graphs, enabling them to be connected and queried across institutions. The conceptual backbone of this shared model is the Heritage Digital Twin Ontology (HDTO), which provides a common framework for representing relationships between heritage objects, spaces, and related entities. The formats and vocabularies described above must ultimately align with this shared model and will be further specified in the context of WP8. At the infrastructure level, all tools and applications connect to the ECCCH through REST APIs and SPARQL endpoints, within a decoupled architecture designed for flexible federation, and access is managed through a federated Authentication and Authorization Infrastructure (AAI).

II.10 Guidelines for Musical Installations Maintenance

The involvement of curators responsible for the music venues included in the project—particularly in the case studies identified by region, period, and musical genre—began at the project’s outset, either directly or through project partners. This engagement represents a crucial step in strengthening the scientific collaboration network and facilitating access to the sites along the itineraries.

It covered various aspects:

- 1) the selected musical venues (about four for each itinerary) and their relevance to the musical itinerary and their accessibility;
- 2) the narrative structure, focusing on the musical event, the cultural context, the connection between music and venues, and the physical museum artefacts;
- 3) the virtual integration of various musical forms with metadata drawn from all available sources (e.g., scores, accounts of musical events, stories, diaries);
- 4) digitisation and audiovisual recording activities based on the acoustics of the selected venue and its historical and musical significance (audio-visual recording of the musical performance at the venue, using 4K video, 360° video and audio recording via ambisonic microphones; 3D digitisation of spaces and objects, or 360° photographic surveys of a venue);

Design of Itineraries and Scenarios

- 5) availability for short interviews as experts in 4K video;
- 6) the conversion of available resources into new digital musical resources designed to highlight both the spatial characteristics and the content linked to the cultural and historical context of the venues concerned.

This involvement also included sending a formal invitation letter, signed by the project's scientific coordinator and the director of the Institute of Cultural Heritage Sciences of the National Research Council. The letter was tailored to each case study and venue and included a brief overview of the project's objectives, activities, and partners.

For these reasons, following the preparation of detailed forms for the identified case studies (see Section III), it is useful at this stage of the project to establish general guidelines for the museum curators involved. These guidelines concern the management of digital musical installations, with the aim of integrating traditional museum conservation with IT systems and acoustic engineering, as well as—above all—the management of rights and licences.

The first aspect concerns the comprehensive documentation of the digital musical resource. This includes not only technical specifications (e.g. acoustics and software repositories), but also the artist's intent—particularly what should remain unchanged over time. Ideally, this intent would be captured through interviews conducted before or after each live recording. The process also addresses the resource's long-term preservation.

The second aspect concerns the long-term management and maintenance of installations (hardware and software) subject to obsolescence due to use and technological change, to preserve their acoustic and interactive quality and integrity. In this context, it would be useful to develop a questionnaire for curators and museum assistants to document any operational or management issues encountered over time.

The third aspect concerns the management of rights and licences for the use and reuse of digital musical resources, at the intersection of European directives, national copyright law, and regulations governing the protection of musical cultural heritage. Although these frameworks are not always fully aligned, they are currently undergoing a process of harmonisation.

II.10.1 Sustainability and Maintenance of Digital Tools and Applications in Cultural Venues

Museums tend to be cautious about making digital technologies a permanent part of their exhibitions. They often lack the necessary investments, trained personnel, and strategies for maintenance, technology modernization, and content updating.

Design of Itineraries and Scenarios

Technologies require routine upkeep, which includes recalibrating hardware, updating software, regularly cleaning electronic equipment, and replacing perishable materials like sensors, air filters, and lamps.

Museums emphasize a strong need for technologies that are robust, user-friendly, and simple to manage daily without requiring extensive training for staff or users. At the same time, developers of digital applications must supply museum staff with live training and comprehensive set-up guides that include visual support like screenshots and procedure flows to ensure proper handover and maintenance.

Even though museum staff may not perform complex repairs themselves, they must be trained enough to communicate required technical information to qualified repair technicians.

Selecting the right technology is therefore crucial.

At present, the following digital devices have been considered to engage users with musical itineraries within museums and cultural venues:

- 1) panels installed in rooms along the tour route. These panels feature the PlaceMUS XR logo, a link to the project, and a brief presentation of the music venue. A QR code allows visitors to access the narrative content through their personal mobile device, providing further information on the entire itinerary. Additionally, high quality sound devices or audio-video can be installed to allow visitors to listen to historical soundscapes and musical repertoires;
- 2) possible non-invasive installations, such as still sound devices (e.g., sound showers or directional speakers) and sound augmented reality applications along the visiting route to be enjoyed through earphones. These allow visitors to hear how musical repertoires respond to the acoustics of their original performance spaces;
- 3) touchscreens to provide access to visual and textual content explaining the musical genre and its links to the acoustic space, the site, and related historical figures;
- 4) **PlaceMUS XR On the Move** to grant access to dynamic audio-visual storytelling and recordings through personal devices;
- 5) **holographic showcase** installed in a dedicated space and designed for simple interaction. It is a robust, easy-to-use system conceived as a mixed-reality environment, combining real objects with virtual projections. This coexistence keeps users' attention focused on the artefact as the central element, both conceptually and physically. The showcase functions as a small theatre,

where virtual animations and narrative fragments emerge from the real objects and their details;²⁶

- 6) interactive **immersive VR experiences** with head mounted displays;
- 7) non interactive **video projections** in the place.

II.10.2 EU Legislation

As regards EU legislation, the Directive (EU) 2019/790²⁷ (Copyright) facilitates access to a wider range of copyright-protected content for educational, cultural and research purposes.

With respect to Cultural Heritage, it permits museums and cultural institutions to:

- 1) make copies of any work in their permanent collection (including digital music files) in any format or medium, using the latest digital techniques, for the sole purpose of preservation, without having to seek new authorisation (article no. 6: Preservation of cultural heritage);
- 2) carry out automated analysis of digital music for research purposes (article no. 4: Exception or limitation for text and data mining);
- 3) make recordings available online (for non-commercial use) through simplified licensing arrangements with collective management organisations. This applies where a recording is no longer commercially available and by cultural heritage institutions in any Member State (articles nos 8-9: Use of out-of-commerce works and other subject matter by cultural heritage institutions; Cross-border uses).

Directive 2001/29/EC (InfoSoc), although superseded in several respects, still governs the right of communication to the public. Accordingly, whenever a museum or cultural venue presents a digital installation, this constitutes an act of communication to the public, requiring a licence for both the underlying composition and the phonogram (the specific recording).

Furthermore, Directive (EU) 2019/1024²⁸ (Open Data and Public Sector Information) encourages the re-use of digital assets held by museums. If a museum holds the copyright to a digital music recording—for example, a field recording made by museum staff—the directive encourages making such data available for reuse (com-

²⁶ E. Pietroni *et al.*, “Bringing the Illusion of Reality Inside Museums—A Methodological Proposal for an Advanced Museology Using Holographic Showcases” *Informatics* 6(1), 2019.
<https://doi.org/10.3390/informatics6010002>;

A. Pagano *et al.*, “User eXperience (UX) Evaluation for MR Cultural Applications: The CEMEC Holographic Showcases in European Museums” *Applied System Innovation* 4(4), 2021, 92.
<https://doi.org/10.3390/asi4040092>

²⁷ <http://data.europa.eu/eli/dir/2019/790/oj>

²⁸ <http://data.europa.eu/eli/dir/2019/1024/oj>

mercial or otherwise) under open licences such as Creative Commons. It also establishes that the costs of reuse should be limited to the marginal costs incurred for reproducing and disseminating the data.

Finally, Directive 2012/28/EU²⁹ (Orphan Works) provides a legal ‘safe harbour’ for museums to digitise and reproduce ‘orphan’ musical works, provided that a record of a ‘diligent search’ has been entered into the European database managed by the EUIPO (European Union Intellectual Property Office).

II.10.3 Moral Rights

Although the European Union harmonises economic rights relating to the commercial exploitation of works, the so-called moral rights (authorship and integrity of the work) remain strictly a matter for national jurisdiction, and this remains the main point of divergence.

First and foremost, the difference between civil law and common law countries must be highlighted. In the former, moral rights are considered inalienable and are managed by so-called collecting management organisations (for example: SIAE³⁰ in Italy; SACEM³¹ in France; ZAIKS³² in Poland; ARTISJUS³³ in Hungary); the latter (Ireland and the UK, which after Brexit is no longer bound by the new European directives) tend to take a more flexible approach to contracts waiving moral rights, making it easier to make technical modifications.

In the case of musical installations (whether digital or physical), the following must be considered:

- 1) copyright protecting the melody and structure is held by the composer (and the lyricist); along Directive 2006/116/EC³⁴ in the EU, this lasts for 70 years after the author’s death (or that of the last surviving co-author);
- 2) the rights related to performance and recording belong to the musicians and they are also deeply connected with music industry where are known as neighbouring rights or related rights;
- 3) if the resource includes videos or identifiable vocal samples, issues of image rights (i.e., publicity rights) and voice rights may also arise, as these can remain with the artist—particularly in the case of digital installations using AI or holograms.

²⁹ <http://data.europa.eu/eli/dir/2012/28/oj>

³⁰ <https://www.siae.it/>

³¹ <https://www.sacem.fr/en>

³² <https://www.zaiks.org.pl/en>

³³ <https://www.artisjus.hu/english/>

³⁴ <http://data.europa.eu/eli/dir/2006/116/oj>

Design of Itineraries and Scenarios

Along with project partners, museum or cultural venues must check the terms of use or licence for various purposes: public performance (which requires an agreement with any relevant national collecting management organisations, unless the work is directly licensed by the artist to the museum/cultural venue); archiving and creating backup copies, migrating data to new servers or changing format; educational and promotional use (digital catalogues, apps, promotional videos on social media, podcasts or audio guides).

For PlaceMUS XR, which is a non-profit research project funded by the European Union, the contractor is the PlaceMUS XR partners, who are covering the costs. The contract, however, must specify that the content will be uploaded to the PlaceMUS XR virtual museum and integrated into the ECCCH ecosystem, with a commitment to provide the necessary documentation to the various management organisations. This means that the PlaceMUS XR consortium and other users can access the content which will be integrated into the ECHOES ecosystem, subject to the terms of the agreed licence. Furthermore, since the results of the project must be Open Access, it is preferable to choose a licence under CC BY (Creative Commons), or, if the digitised material is already technically in the ‘public domain,’ the EU Copyright Directive suggests that the digital file should be labelled as PDM (Public Domain Mark) or CC0 (No rights reserved).

As the project also involves partnerships with the UK and Georgia, and the use, in some cases, of religious sites, further thoughts must be put into the following issues. Upon Brexit, the UK is no longer bound by new EU Directives (such as EU Copyright Directive) and the UK Copyright, Designs and Patents Act 1988 applies.³⁵ The UK has chosen not to transpose certain European protections for museums regarding out-of-commerce works. Therefore, if the digital music installation is to be part of a network of music venues that includes the UK, it will be necessary to ensure that the licence explicitly covers UK territory. Furthermore, as it is common practice in the UK to ask the artist to waive their moral rights, it may also be necessary for the artist to sign a waiver clause, including to be able to repair or modify the installation’s software without restrictions.

As for Georgia, since it participates in Horizon EU as an associated country, it must comply with EU rules on Open Access. For any local contracts, however, care must be taken to specify the jurisdiction of the national managing authority,³⁶ although in the event of disputes, the terms of the project’s Grant Agreement take precedence.

A final point concerns places of worship. The religious exemption applies only to liturgical use; when a physical or digital installation is intended for tourism or presented as a multimedia product, it is subject to the same reproduction and public communication rights as museum contexts. Specific agreements may exist between

³⁵ <https://www.legislation.gov.uk/ukpga/1988/48/contents>

³⁶ <https://www.sakpatenti.gov.ge/en/>

ecclesiastical bodies and national collecting societies (e.g., in Italy between the Italian Episcopal Conference and SIAE). In addition, a nihil obstat from the religious authority is required, which may also include a veto if the musical content is considered inappropriate for the sacred context.

II.10.4 Regulations Governing the Protection of Musical Cultural Heritage: Some Italian Examples

The use and reuse of musical cultural heritage is linked not only to European legislation and national rules on moral rights, but also to supranational and national protection regulations. As such, it seems appropriate to examine in greater depth specific aspects related to the use and reuse of musical cultural heritage.

Musical cultural heritage, in fact, has a dual nature—both tangible and intangible—which gives it a unique place within the greater domain of cultural heritage.³⁷

The UNESCO framework, comprising the 2003 and 2005 Paris Conventions on the Safeguarding of the Intangible Cultural Heritage³⁸ and the Protection and Promotion of the Diversity of Cultural Expressions,³⁹ provides the basis for European legislation and national heritage codes, such as Italy's Code of Cultural Heritage and Landscape⁴⁰ and France's Code du Patrimoine.⁴¹ Musical heritage, however, is not consistently defined in national legislation, including the Italian code, where it is treated mainly as an object of protection.

Musical Heritage is often treated indirectly within existing categories: for example, a musical score may be classified as a book, a scientific sketch as a drawing, and musical heritage may also include immovable property such as theatres, historic buildings associated with specific musical genres or histories, or artists' studios.¶ For these reasons, when using and reusing musical cultural heritage, these aspects also require consideration, and one must first determine under which category of cultural heritage the specific musical item falls within the scope of Articles 10–13 of the Code.

Regarding use, the Italian Code grants two general types of licence:⁴² one for the reproduction of both movable and immovable cultural assets (including in a digital

³⁷ A. Pompilio and A. Iannucci, "Il patrimonio musicale: entità materiale e immateriale" // *Saggiatore Musicale* 24(2), 2017, 263-272;

P. Carpentieri, "La musica tra attività culturali, patrimonio culturale materiale e patrimonio culturale immateriale" *Aedon* 3, 2024, 280-289.

³⁸ <https://ich.unesco.org/en/convention>

³⁹ <https://www.unesco.org/en/legal-affairs/convention-protection-and-promotion-diversity-cultural-expressions>

⁴⁰ <https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:decreto.legislativo:2004-01-22:42!vig=>

⁴¹ https://www.legifrance.gouv.fr/codes/texte_lc/LEGITEXT000006074236/

⁴² Linee guida per l'acquisizione, la circolazione e il riuso delle riproduzioni/Guidelines for the acquisition, circulation and reuse of reproductions, 2022-2023:

<https://docs.italia.it/italia/icdp/icdp-pnd-circolazione-riuso-docs/it/v1.0-giugno-2022/index.html>;

Design of Itineraries and Scenarios

environment), the other for the use of spaces (without taking into account any third-party rights about the use of reproductions of works protected by copyright law: see above).

With regard to the first category, it should be noted that, pursuant to article no. 108(3) of the Code, no fee is payable for reproductions requested or produced by public or private entities for the purposes of promotion or study, provided that they are carried out on a non-profit basis; authorisation, however, must be obtained from the institution holding the work.

A practical example: the reproduction of a Stradivari violin from a state collection to create its digital twin and its non-profit reuse for exhibition, scientific, educational, and public information purposes, is free of charge. If the reproduction involves several items, institutional collaboration agreements are required.

Furthermore, Article 108(3-bis) permits the reproduction of cultural heritage without prior authorisation, establishing the free dissemination of images of public cultural heritage, provided this is non-profit and for purposes such as study, research, freedom of expression, creative activity, or the promotion of cultural heritage knowledge.

Similarly, reproductions of images of cultural heritage contained in open-access publications are to be considered free of charge, as they have no cover price.

The second category includes reproductions that can only be made with permission from the relevant authority for the use of the spaces.

For instance, in the case of recordings made in or 3D reproductions of historic building, it is necessary to ensure that such use is compatible with the building's historical or artistic features and does not compromise its conservation. From a practical standpoint, the local authority must grant permission for its use. Where it serves institutional aims and cultural heritage promotion, such permission is free of charge, although costs related to museum staff duties, extended opening hours, and safety must be borne by the concessionaire or authorised party.

Regarding the procedures for publishing digital reproductions online, specific Guidelines for the Digitisation of Cultural Heritage have been published as part of the National Plan for the Digitisation of Cultural Heritage.⁴³ For reproductions of public cultural heritage, licences other than Creative Commons should be used, such as

Linee guida per la determinazione degli importi minimi dei canoni e dei corrispettivi per la concessione d'uso dei beni in consegna agli istituti e luoghi della cultura del Ministero della cultura/Guidelines for determining the minimum amounts of rent and fees for the concession of *use of cultural heritage entrusted to cultural institutions and venues under the Ministry of Culture*, 2024:

<https://media.cultura.gov.it/mibac/files/boards/be78e33bc8ca0c99bff70aa174035096/DECRETI/ANNO%202024/DM%2021%20marzo%202024%20rep.%20108-signed.pdf>

⁴³ <https://partecipa.gov.it/processes/Linee-Guida-Digitalizzazione-3D>;

https://digitallibrary.cultura.gov.it/wp-content/uploads/2023/04/PND_V1_1_2023_v2.pdf

the 'Beni Culturali Standard' (BCS) label, which defines lawful reuse for study, research, and promotion in line with RightsStatements.org as adopted by Europeana.⁴⁴

II.11 What to Do to Design Scenarios and Itineraries - Checklist

- ❖ To have a general criterion, the following should be included:
 - multi-level conceptual structure;
 - multiple forms of storytelling;
 - gamification to increase inclusivity;
 - embodiment and authenticity of the experience to enhance the neuroaesthetic potential;
 - reliability in musical practices reconstructions to preserve the heterogeneity and diversity inherent to each situation.
- ❖ To choose the typology (or typologies) of places involved, the following should be considered:
 - sites of music creation and practice;
 - sites of musical craftsmanship and production;
 - sites of musical heritage.
- ❖ To select core concepts for itinerary development in relation to place typologies, the following should be considered:
 - genre-based itinerary;
 - territorial itinerary;
 - biographical itinerary;
 - site-specific itinerary;
 - a playful journey through the key concepts of music;
 - engaging activities to learn and interact with harmony, rhythm, tune, suitable for everyone, regardless of physical disability or lack of musical training.
- ❖ To find narrative connections between places, the following should be included:
 - place-based content;
 - contextual content.

⁴⁴ <https://pro.europeana.eu/page/available-rights-statements>

D 3.1

Design of Itineraries and Scenarios

- ❖ To quantify and verify:
 - select about 4 places, possibly represented as follows:
 - a place (with interesting acoustics properties) through a detailed 3D model with spatial acoustic reconstruction;
 - a place through interactive 360° panoramas. Each place could have more than one 360° representations, referred to different spaces/rooms, with a maximum of 3 360°;
 - each place will have a minimum of:
 - 3 3D objects,
 - 2-3 live performances with musicians, (max duration 5' each one) or/and integration of discography and archival material;
 - 1 4K video (general intro of the place and its relevance in the itinerary, with storytelling, duration 4');
 - 1 360° video recordings with storytelling (duration 3');
 - 1 audio-video Interview (duration 3').
 - verify the accessibility of places;
 - identify responsible and contact persons;
 - obtain internal and informal agreement on the use of the spaces and verify the possibility to create site specific installations along the itinerary;
 - verify the specific needs for the different levels of accessibility (age, gender, cultural background, skill levels, impairments)⁴⁵;
 - verify all permissions required to use spaces or to reproduce digitally cultural assets;
 - send a formal letter of invitation to participate in the project;
 - verify the availability of musicians or ensembles for on-site performances, and check their requirements regarding copyright (for recording and reuse within the PlaceMUS XR virtual museum and ECCCH ecosystem) and fees, in accordance with EU and national legislation.
- ❖ to fill the form to collect information on case studies (see Section III);
- ❖ to collect existing resources (audios and video recordings) and available historical documentation and literature from archives and databases, privilege sources of public domain (PDM) or, where copyright applies, Creative Commons license (CC) about itineraries and scenarios.

⁴⁵ This topic will be addressed in more detail in WP4 "Accessibility of Media & Tools".

SECTION III: Case Studies

III.1 Music in Renaissance Loire Valley

1. Itinerary, Sites, and Their Potentialities

Leader partner: [RicerCarLab](#) (CNRS-University of Tours).

Itinerary name: Music in Renaissance Loire Valley.

Type of itinerary: territorial and musical genre-based (polyphony).

Location(s): Centre-Val de Loire Region (France): Tours (Saint-Martin quarter), Blois, Châteaudun, Chambord.

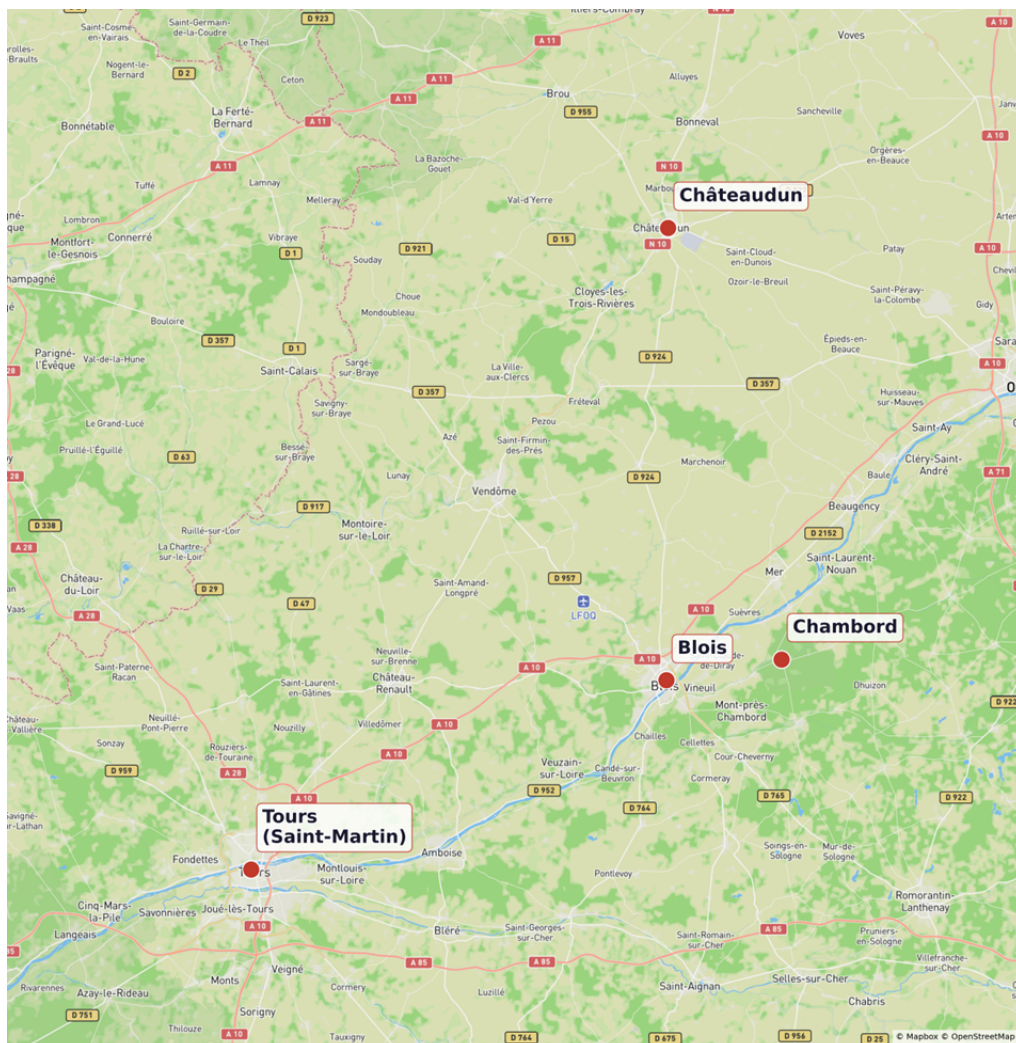


Figure 11. Music in Renaissance Loire Valley.

Design of Itineraries and Scenarios

Itinerary description:

This itinerary explores the historical soundscape of the Loire Valley (inscribed in the UNESCO Heritage sites list), showing how sacred and secular architecture, patrons' and musicians' mobility, and political power influenced musical practices between the fifteenth and seventeenth centuries. It builds on some existing projects, such as the 4D reconstruction of the collegiate church of Saint-Martin in Tours (destroyed during the French Revolution) and the *Cubiculum Musicae* in Châteaudun, an installation combining 3D reconstructions of historical sites, immersive audiovisual devices, and historically informed recordings. As such, the PlaceMUS XR project integrates RicercarLab initiatives to propose a 'phygital' journey that combines on-site and remote experiences. It also serves as a methodological testbed for integrating datasets, tools, and narrative layers within the ECCCH infrastructure.

Main stops of the itinerary and selected objects:

- Tours, Centre d'Interprétation de l'Architecture et du Patrimoine (CIAP); 4D reconstruction of the collegiate St. Martin and animation with period musicians and performance of Johannes Okeghem's *Requiem* (1480) inside the collegiate; Okegame (Game);
- Tours, *Cubiculum Musica* at the Centre d'études supérieures de la Renaissance; *De plus en Plus Mass* (1460) by J. Okeghem;
- Châteaudun, Sainte-Chapelle, *Cubiculum Musicae* installation and audiovisual devices accessible via QR Code; Recording of Eloy d'Armeval's *Dixerunt discipuli* Mass (1500ca);
- Blois, Royal Castle, virtual stop in the king's bedroom; recordings of Didier Le Blanc's and Fabrice-Marin Caiétan's *airs de cour* (late sixteenth century);
- Chambord, Royal Castle, virtual stop in the top of the stairs; music by Pierre Robert (end of the seventeenth century).

Objectives:

- to highlight the connection between musical repertoires with the places where they were originally performed (emphasizing social and historical contexts, as well as the architectural features of each historical site);
- to explore music as a medium of political, social, and ceremonial communication;
- to develop scalable tools for heritage interpretation within ECCCH;
- to test integration of datasets, 3D models, MEI music, XR tools, documentaries, and narrative models into ECCCH.

Challenges:

- fragmentation of historical documentation;

Design of Itineraries and Scenarios

- absence of original furnishings and acoustic traces;
- balancing historical accuracy and immersive reconstruction;
- communicating scholarly uncertainty to non-specialists.

Collaborations (partners, institutions): Centre d'études supérieures de la Renaissance (RicercarLab), Centre des Monuments Nationaux, Ministry of Culture, City of Tours.

2. Musical and Cultural Heritage

Musical genres: fifteenth-, sixteenth- and seventeenth-century polyphony, sacred music (motets, masses), and secular music (airs).

Social impact: the itinerary reveals the role of music in shaping social, political, and religious life; it also supports education, cultural mediation, and heritage tourism.

Key figures (composers, performers, patrons): Johannes Okeghem, Johannes Tinctoris, Eloy d'Amerval, Didier Le Blanc, Fabrice-Marin Caiétan, Pierre Robert, French kings, courtly patrons.

Relevant events: liturgical ceremonies, court festivities, popular processions

Instruments: vocal repertoire accompanied by instruments.

Historical recordings: historically informed recordings specifically produced by RicercarLab.

3. Connected Arts and Objects

Connected arts (e.g., visual arts, performance): liturgical spaces, court ceremony, specific subsistent architectures.

Objects and collections: manuscripts, liturgical books, musical scores, architectural elements, digital reconstructions.

Authors / creators: composers, scribes, illuminators, architects.

Locations of objects: local monuments (Tours, Châteaudun), national and international collections, digital repositories.

4. Immersive Technologies

VR: 3D reconstruction of Saint-Martin and immersive audiovisual environments.

Online accessibility: Web platforms (Virtual Music Heritage, Cubiculum Musicae applications) enabling remote access; mobile access to narrative content and sound through QR-based paths.

D 3.1

Design of Itineraries and Scenarios

On-site experience: *Cubiculum Musicae* installations combining sound diffusion, video, and interactive devices; hybrid physical-digital pathways.

Expected impact on visitor engagement: enhanced understanding of music as cultural heritage; multisensory and narrative engagement; improved accessibility and replicability across sites.

III.2 Music in Renaissance Ferrara

1. Itinerary, Sites, and Their Potentialities

Lead partner: [RicercaLab](#) (CNRS-University of Tours).

Itinerary name: Music in Renaissance Ferrara.

Type of itinerary: territorial (a city in a specific period).

Location(s): Ferrara (Italy): Cathedral Museum, Palazzo Schifanoia, Church of San Cristoforo (Certosa), Ludovico Ariosto's House, Palazzina Marfisa d'Este, Convent of Sant'Antonio in Polesine.



Figure 12. Map of Ferrara with the itinerary's stops.

Itinerary description:

This itinerary explores Ferrara (a city inscribed in the UNESCO Heritage sites list) as one of the most important European centres for music production during the Renaissance. Between the fifteenth and late sixteenth centuries, the Este family's patronage established the city as a hub of musical innovation. They attracted prominent composers, including Josquin Desprez, Adrian Willaert, Luzzasco Luzzaschi, and Carlo Gesualdo. The Estes also encouraged the development of new musical practices, the flourishing of the madrigal, and innovative instrument making. Music permeated both sacred and secular spaces, shaping artistic creativity, social identity, and political prestige. The itinerary brings together key sites that bear witness to the city's liturgical, courtly, poetic, and performative traditions enriched by immersive tools. The Civici Musei di Arte Antica in Ferrara preserve a large collection of choral books, a heritage object generally ignored by the public because of the complexity of the content (both musical and iconographical). This itinerary aims to develop tools and specific installations that provide different musical and heritage perspectives for discovering these precious objects. The itinerary will develop a sacred and a secular path of the Renaissance music in Ferrara. It will also experiment the "*Cubiculum musicae* shower" a new tool developed by RicercarLab.

Main stops of the itinerary and selected objects:

- [Cathedral Museum](#) & Palazzo [Schifanoia](#); Installation granting access to illuminated choirbooks (fifteenth–sixteenth centuries);
- [Church of San Cristoforo](#); an animated AR reconstruction will feature will standing in the fifteenth-century wooden choir stall and singing from a period choirbook position on a lectern;
- [House of the poet Ludovico Ariosto](#); poetic-musical performances of *cantastorie* tradition (reproduced through recording);
- [Palazzina Marfisa d'Este](#); madrigals and courtly dance in the loggia (a Renaissance place of music);
- Covent of [Sant'Antonio in Polesine](#); music for Renaissance banquets in connection with the tomb of Cristoforo Messi Sbugo, the famous renaissance organiser of banquets and cook.

Objectives:

- reconnecting musical heritage with the places where it was originally performed;
- making complex musical sources accessible to a generalist audience;
- reconstructing historical soundscapes;
- enhancing visitors' engagement.

Challenges:

- musical heritage often neglected in museums;
- complexity of the notation system of early music sources;
- fragmentation of sites and practices.

Collaborations (partners, institutions):

Musei Civici di Arte Antica, Comune di Ferrara, Ferrara Musica, PlaceMUS XR Consortium.

2. Musical and Cultural Heritage

Musical genres: plainchant and sacred monophonic repertoires, sacred polyphony, madrigal, strambotto, dance music performed during banquets.

Social impact: music shaped religious, social, and courtly life in Renaissance Ferrara.

Key figures (composers, performers, patrons): Josquin Desprez, Luzzasco Luzzaschi, Giaches de Wert, Bartolomeo Tromboncino, Serafino Aquilano, Alessandro Piccinini, Paolo Virchi, Tuttovale Menon.

Relevant events: court performances, liturgical ceremonies, musical-poetic recitations, dance spectacles.

Instruments: lira da braccio.

Historical recordings: existing and *ad hoc* recordings.

3. Connected Arts and Objects

Connected arts (e.g., visual arts, performance): painting, sculptures, poetry, dance, theatre plays, illuminated manuscripts.

Objects and collections: choirbooks, choir lecterns, manuscripts, early printed scores, architectural spaces, tombs.

Authors / creators: Guglielmo Giralaldi, Martino da Modena, Jacopo Filippo da Argenta, Andrea delle Vieze.

Locations of objects: Cathedral Museum, Palazzo Schifanoia, Cathedral of Ferrara, Convent of Sant'Antonio in Polesine, libraries and archives.

4. Immersive Technologies

VR: reconstruction of historical environments and performances.

AR: exploration of choir spaces and musical practices.

D 3.1

Design of Itineraries and Scenarios

Online accessibility: applications with audio, 3D models of instruments (lira da braccio), of musical furniture (such as lectern), and open-access materials.

On-site experience: sound showers, AR installations, interactive screens, QR codes, *Cubiculum Musicae* musical shower (a device specifically designed to allow immersive musical listening).

Expected impact on visitor engagement: improved accessibility, better understanding allowed by immersive experiences, stronger connection between music, objects, and places.

III.3 A Madrigal Journey Through Renaissance Italy

1. Itinerary, Sites, and Their Potentialities

Leader partner: CNR.

Itinerary name: A Madrigal Journey Through Renaissance Italy.

Type of itinerary: musical genre-based.

Location(s): Italy (Naples, Rome, Ferrara, Mantua, Venice).



Figure 13. Map of Italy with madrigal journey's stop.

Itinerary description:

This itinerary explores the repertoire and the auditory practices of the Italian madrigal as a central musical genre of the Renaissance and early-modern period, highlighting its transformation into a highly expressive and theatrical form. Focusing on

D 3.1

Design of Itineraries and Scenarios

six major Italian courts and cities, visitors discover how the madrigal emerged as an expressive form in which music and poetry combine to convey human emotions through counterpoint and word-painting (i.e. madrigalisms). From the second half of the sixteenth century, the madrigal gained widespread popularity across Europe, particularly in France, Flanders, England, and Germany, due to its poetic imagery and dramatic narratives. Its integration in theatrical practices (in Florence, Mantua, and Ferrara) as well as its adaptation to the musical capacity of specific ensemble (e.g., the Concerto delle dame in Ferrara) transformed this genre, originally conceived as purely polyvocal, into a form that could also be performed by a soloist with basso continuo accompaniment. The journey connects major cultural centres such as Rome, Florence, Ferrara, Mantua, Venice and Naples, where composers like Philippe Verdelot, Costanzo Festa, Jacques Arcadelt, Adrian Willaert, Luca Marenzio, Luzzasco Luzzaschi, Carlo Gesualdo, Giaches de Wert, and Claudio Monteverdi developed distinct musical languages. Through immersive technologies and performances, the itinerary restores the sonic dimension of the genre in some specific spaces.

Main stops of the itinerary and selected objects:

- Rome, [Palazzo Barberini](#) (or [Villa d'Este in Tivoli](#));
- Ferrara, Este court ([Palazzina Marfisa](#) or Schifanoia);
- Firenze, virtual stop (or [Palazzo Strozzi](#) and [Palazzo Medici Ricciardi](#))
- Naples, Palazzo di Sangro and Biblioteca dei Girolamini;
- Mantua, [Palazzo Ducale](#);
- Venice, [Palazzo Mocenigo](#).

Objectives:

- restore the sonic dimension of the madrigal in connection with the historical sites where it was cultivated;
- connect music, space, and cultural context;
- enhance accessibility to musical heritage in historical sites;
- promote immersive experiences.

Challenges:

- musical heritage often invisible in heritage sites;
- limited integration of sound in digital heritage;
- access restrictions in some locations;
- fragmentation of sources.

Design of Itineraries and Scenarios

Collaborations (partners, institutions): PlaceMUS XR Consortium, MiC, Fondazione Musei Civici Venezia, Comune di Ferrara, Concerto Italiano.

2. Musical and Cultural Heritage

Musical genres: Italian madrigal (sixteenth–seventeenth centuries).

Social impact: madrigals shaped courtly life, intellectual exchange, and artistic identity. In spite of the use of Italian poetry, the madrigal became a European genre.

Key figures (composers, performers, patrons): C. Monteverdi, C. Gesualdo, L. Marenzio, L. Luzzaschi, G. de Wert, A. Willaert;

Relevant events: court performances, academies, private concerts, festivals.

Instruments: primarily vocal; later basso continuo (harpsichord, theorbo, harp, viola da gamba, lute).

Historical recordings: Monteverdi madrigals recorded by Concerto Italiano.

3. Connected Arts and Objects

Connected arts (e.g., visual arts, performance): poetry, theatre, early opera, court spectacle, dance.

Objects and collections: musical scores, printed editions, letters, architectural spaces.

Authors / creators: C. Monteverdi, C. Gesualdo, L. Marenzio, L. Luzzaschi, A. Willaert, C. Festa, Ph. Verdelot.

Locations of objects: Naples' Girolamini Library, Mantua's Palazzo Ducale, Venice's museums, Roman palaces, Ferrara's Musei Civici di Arte Antica and related collections.

4. Immersive Technologies

VR: reconstruction of performance spaces.

AR: sound-based AR experiences.

Online accessibility: Web XR platform and digital archives.

On-site experience: bone-conduction headphones, directional speaker and showers, QR-based storytelling.

Expected impact on visitor engagement: immersive listening, improved accessibility, stronger connection between music and places.

III.4 Organs, Sacred Architecture, and Urban Soundscapes in Krakow

1. Itinerary, Sites, and Their Potentialities

Leader partner: [Map](#) (CNRS) and [Krakow University of Technology](#).

Itinerary name: Organs, Sacred Architecture, and Urban Soundscapes in Krakow

Type of itinerary: territorial and musical genre-based.

Location(s): Krakow (Poland): Tyniec Abbey Church of St. Peter and Paul, Church of the Holy Cross, St. Florian Church, Lord's Ark Church.



Figure 14. Map of Krakow organs journey.

Itinerary description:

This itinerary explores the relationship between organ music and sacred architecture in Kraków across different periods. It begins at the eleventh-century Benedictine Tyniec Abbey on the Vistula River, passes through seventeenth- and eighteenth-century organs in the historic centre, and concludes at the Lord's Ark Church in Nowa Huta—a symbol of resistance to the communist regime—where a modern organ is housed. The itinerary combines territorial and genre-based approaches to offer a situated and immersive experience through acoustic simulations, musical performances, and historical narratives that highlight the role of organ music in sacred interiors and in the city's history.

Main stops of the itinerary and selected objects:

- Tyniec Abbey, Church of St. Peter and Paul: fifteenth- and seventeenth-centuries monastic architecture and organ reconstructed in 2024 on a sixteenth-century model;
- Church of the Holy Cross: fourteenth-century architecture and historical organ dating 1704 (subsequently restored in the twentieth century);
- St. Florian Church: seventeenth-century architecture and organ dating 1756-1761 (subsequently restored and rebuilt in the twentieth century);
- Lord's Ark Church (Nowa Huta): modern sacred architecture and contemporary organ (built in 1979).

This itinerary also includes "side stops": 1) a boat stop at the bottom of the Wawel Hill, 2) the Słowacki Theater, 3) the medieval city walls and Gothic barbican, 4) Matejko Square with the Grunwald Monument, 5) Central Square in Nowa Huta.

Objectives:

- to explore the relationship between music, acoustics, and architecture;
- to enhance perception of sacred spaces through sound;
- to document and experience historical acoustic environments remotely;
- to promote awareness of organ heritage in Krakow;
- to allow users to perceive in a single immersive environment how music and musical instruments respond to different spaces' acoustic properties.

Challenges:

- limited visibility of music in heritage interpretation;
- technical complexity of acoustic measurements;
- access to sacred spaces and restricted areas;

Collaborations (partners, institutions): Krakow University of Technology, Krakow Academy of Music, Benedictine Abbey in Tyniec (museum and foundation), local churches, 23rd International Organ Festival in Krakow (2026).

2. Musical and Cultural Heritage

Musical genres: organ music (From Renaissance to contemporary repertoires).

Social impact: the itinerary strengthens public awareness of the role of music in sacred architecture and urban identity; it also supports education for schools and cultural tourism.

D 3.1

Design of Itineraries and Scenarios

Key figures (composers, performers, patrons): seventeenth- and eighteenth-centuries Polish (e.g., Diomedes Cato, Adam Jarzębski, Marcin Leopolita, Franciszek Lilius, Mikołaj z Krakowa), German (e.g., Johann Sebastian Bach, Georg Böhm, Nicolaus Bruhns, Dieterich Buxtehude, Johann Ludwig Krebs, Johann Kuhnau, Vincent Lübeck, Johann Pachelbel, Johann Adam Reincken, Heinrich Scheidemann, Franz Tunder, Johann Gottfried Walther, Matthias Weckmann), Italian (e.g. Frescobaldi, Pasquini, Zipoli) and French (e.g. Couperin) composers.

Musical work foreseen at step one (exploratory): Paul Siefert (1586–1666), *Toccata*; Arnolt Schlick (1460–1521), *Ascendo ad patrem meum*; Hans Leo Hassler (1564–1612), *Canzona a 4 voc.*; *Tabulatura gdańska* (1570–1590), *Veni in hortum meum* (Orlando di Lasso: *Veni in hortum meum*). *Tabulatura Jana z Lublina* (1537–1548), *Chorea*, *Crux Fidelis*.

Relevant events: religious services, organ concerts, international organ festivals

Instruments: Historical and modern organs.

Recordings: the recording will be produced through live recordings and performances supported by the project.

3. Connected Arts and Objects

Connected arts (e.g., visual arts, performance): liturgy, sacred architecture, urban history.

Objects and collections: organs, church interiors, liturgical furnishings, musical scores.

Authors / creators: architects (e.g. Wojciech Pietrzyk), organ builders (historical and modern).

Locations of objects: Krakow churches (Tyniec, Old Town, Nowa Huta).

4. Immersive Technologies

VR: 3D reconstruction of selected spaces (Tyniec Abbey), 3D organ model, and audio-visual auralisation.

Online accessibility: web-based interaction with soundscapes and acoustic environments.

Online accessibility: Web-based interactive auralisation platform based on 360° panoramas; Spatial Room Impulse Responses (SRIRs) measurements, and soundscapes recording.

On-site experience: Use of personal devices (QR codes), possible site-specific installations, spatial audio listening.

D 3.1

Design of Itineraries and Scenarios

Expected impact on visitor engagement: Enhanced understanding and perception of the relationship between music and space; increased accessibility and multisensory engagement.

III.5 Listening to the Past in Bologna's Museo della musica

1. Itinerary, Sites, and Their Potentialities

Leader partner: [Museo internazionale e biblioteca della musica.](#)

Itinerary name: Listening to the Past in Bologna's Museo della musica.

Type of itinerary: territorial.

Location: Museo internazionale e biblioteca della musica, Palazzo Sanguinetti, Bologna (Italy).



Figure 15. Entrance of the Museo internazionale e biblioteca della musica in Bologna.

Itinerary description:

The itinerary unfolds across nine exhibition rooms inside Bologna's Museo della musica, located in the sixteenth-century Palazzo Sanguinetti. The museum houses a unique collection of musical instruments, over 100 portraits of musicians, and around 250 rare historical documents selected from more than 110,000 items. Rather than focusing on sound itself, the itinerary developed inside the Museo della musica develops an "invisible thread" connecting music history, theory, aesthetics, music printing, and performance practices from the Renaissance to the twentieth century. The museum stands as unique in presenting music through material objects, texts, and images that emphasize the immaterial and performative nature of

D 3.1

Design of Itineraries and Scenarios

music. Visitors can explore how music shaped cultural and social life, especially through Padre Martini's collection of musical objects and musicians' portraits. Current museum visits do not include any musical listening.

In response, collaboration with PlaceMUS XR will enable the development of sonic installations designed to enhance the understanding of selected exhibited objects, while minimising any disturbance.

Itinerary's main stops and objects:

This itinerary unfolds inside the Museo internazionale e biblioteca della musica. Room 2 will focus on Padre Martini as composer and collector of musicians' portraits, music manuscripts, and letters; Room 3 will be dedicated to Wolfgang Amadeus Mozart, featuring the Austrian composer's portrait and autographs; Room 4 will focus on Vito Trasuntino's archicembalo, a unique musical instrument functioning in accordance with the three *genera* of ancient Greek music: diatonic, chromatic, and enharmonic; Room 5 will feature an installation providing an overview of music printing techniques and connecting the exhibited printed books with types, engraving tools, and sound; Room 6 will include Carlo Broschi's (Farinelli) portraits along with informative material on **castrato** bodies, voice, and musical repertoires. The room also contains a portrait believed to depict Antonio Vivaldi and a printed edition of the *Four Seasons*; Room 7 will feature Gioachino Rossini's portrait, personal objects, and the music score of *Barbiere di Siviglia*.



Figure 16. Plan of the Museo della musica's first floor.

Objectives:

- making the immaterial nature of music visible;
- enhancing visitors' engagement through technological mediation;
- connecting objects to their performative and historical contexts.

Challenges:

- music installations used to better understand museums exhibitions are absent from this museum; visitors lament the absence of sound;
- conceptual complexity of object-based interpretation. PlaceMUS XR itinerary will enable the museum to create a narrative pathway and a deeper musical interpretation of a selection of materials through a collaboration with consortium partners.
- **Collaborations:** PlaceMUS XR consortium (PI Eva Pietroni), Museum experts, Accademia Filarmonica (for documentary evidence), Teatro Comunale (for historical recordings).

2. Musical and Cultural Heritage

Musical genres: Renaissance polyphony, opera, sacred music, secular vocal music, instrumental music.

D 3.1

Design of Itineraries and Scenarios

Social impact: Bologna as a Grand Tour destination; Martini's European network; strong public engagement.

Key figures: Giovanni Battista Martini, Wolfgang Amadeus Mozart, Gioacchino Rossini, Antonio Vivaldi, Carlo Broschi, Ottaviano Petrucci.

Relevant events: concerts (Insolita), festivals ((s)Nodi), lecture-concerts, workshops relevant to audiovisual recordings.

Instruments: harpsichords, lyra, pianos, flutes, cornetts, oboes, *clavemusicum omnitonum*.

Historical recordings: audiovisual archives, theatre archives, audioguide.

3. Connected Arts and Objects

Connected arts: visual arts (e.g., painting, sculptures), theatre, opera, live musical performances, polyphonic and instrumental Renaissance music, books.

Objects and collections: musical instruments, musical manuscripts, printed scores, tablatures, librettos, music theory and history treatises, musicians' private correspondence, paintings.

Authors / creators: G. B. Martini, W. A. Mozart, G. Rossini, A. Vivaldi, O. Petrucci, C. Broschi.

Locations of objects: Museo internazionale e biblioteca della musica, Teatro Comunale archives.

4. Immersive Technologies

VR: reconstruction of spaces and historical events.

AR: sound-based AR experiences and object contextualization, a 3D model of one musical instrument.

Online accessibility: digitised collections and QR-based XR content.

On-site experience: audio guides, sound showers, interactive installations.

Expected impact: greater public engagement, accessibility, and making music's immaterial dimension tangible and visible for visitors.

III.6 From Wood to Sound: The Northern Italian Art of Violin Making to Sound

1. Itinerary, Sites, and Their Potentialities

Itinerary name: From Wood to Sound: The Northern Italian Art of Violin Making to Sound.

Type of itinerary: territorial and musical genre-based.

Leader partner: [Museo del Violino di Cremona](#).

Location(s): Cremona (Italy), with connections to Val di Fiemme (Trentino Alto-Adige, Italy).



Figure 17. Treasure room in the Violin Museum in Cremona.

Itinerary description:

The itinerary explores the musical woodlands of Val di Fiemme (Trentino Alto-Adige/Südtirol), the workshops of the famed makers of the Baroque era, famed musical virtuosos, instruments' collectors and restorers, and Cremona's museums. This itinerary has a dual storytelling: the history of violinmaking and stories about famous violinmakers. It explores Cremona as the historical and contemporary centre of musical craftsmanship, tracing all phases of violins' construction—from wood selection to the creation of the soundboard, varnishes, strings, decorations. Performance techniques (sound and gestures) are also discussed. The itinerary combines territorial and organologi-

D 3.1

Design of Itineraries and Scenarios

cal approaches, connecting natural resources (wood, gut), craftsmanship, performance, and research. Through Cremona's Museo del Violino and the city-wide network of workshops, schools, and laboratories, the itinerary highlights the continuity of a tradition of instrument making recognised as UNESCO Intangible Cultural Heritage. By integrating collections, live performances, and digital mediation tools, it offers a multi-layered narrative connecting instruments, makers, performers, and audiences.

Main stops of the itinerary and selected objects:

- Museo del Violino: historical collections, Stradivari workshop tools, concert hall (Auditorium Arvedi);
- violin-making workshops of the city of Cremona (there are 199 workshops);
- the museum's Violin Making School and [Stauffer Academy](#);
- scientific laboratories of acoustic and diagnostics of the University of Pavia and the Politecnico of Milan at the Museo del Violino.

Objectives:

- to communicate the complexity of violin-making and its evolution;
- to connect instruments to their material, the performance and the historical contexts;
- to enhance visitor engagement through multisensory and immersive experiences;
- to support interpretation of collections beyond their material dimension.

Challenges:

- communicating the acoustic and experiential value of the instruments;
- integrating craftsmanship, performance, and scientific research in a coherent narrative.

Collaborations (partners, institutions): PlaceMUS XR consortium (PI Eva Pietroni), University of Pavia, Politecnico di Milano, Violin Making School of Cremona, Stauffer Academy.

2. Musical and Cultural Heritage

Musical genres: western classical music (string repertoire).

Social impact: the itinerary strengthens cultural identity and public engagement through concerts, education, and access to historical instruments; introduces new audiences to live classical performance.

D 3.1

Design of Itineraries and Scenarios

Key figures (composers, performers, patrons): Antonio Stradivari, the Amati family, the Guarneri family, Francesco Rugeri, Carlo Bergonzi, Giovanni Battista Ceruti, Simone Fernando Sacconi, Ignazio Alessandro Cozio di Salabue.

Relevant events: regular recital series, concert seasons, exhibitions, and violin-making competitions.

Instruments: historical and contemporary violins, violas, cellos, double basses.

Historical recordings: live performances and recordings produced within the Museo del Violino and associated activities.

3. Connected Arts and Objects

Connected arts (visual arts, performance, etc.): craftsmanship, acoustics, musical performance, visual arts.

Objects and collections: string instruments, workshop tools, drawings, paintings, archival documents.

Authors / creators: Cremonese luthiers (Amati, Stradivari, Guarneri), collectors and scholars.

Locations of objects: Museo del Violino, Biblioteca Statale di Cremona, Museo Civico.

4. Immersive Technologies

VR: potential immersive environments reconstructing workshops, instrument making, and historical contexts.

AR: interactive storytelling linking instruments, makers, and performance contexts within the violin museum and the city.

Online accessibility: web-based applications and digital guides extending the visit experience.

On-site experience: audio guides, immersive audio room (3D sound dome), touchscreens, live performances, and hybrid installations, room videomapping and diffuse audio, bone conduction or traditional headphones (individual).

Expected impact on visitor engagement: enhanced understanding of the relationship between craft, sound, and performance; increased emotional engagement and accessibility for diverse audiences.

III.7 Music in Budapest: From Liszt to the Táncház

1. Itinerary, Sites, and Their Potentialities

Itinerary name: Music in Budapest: From Liszt to the Táncház.

Type of itinerary: territorial.

Leader partner: [Hangveto Zenei Terjeszto Tarsulas korlatolt Felelossegu Tarsasag](#).

Location(s): Budapest (Hungary).

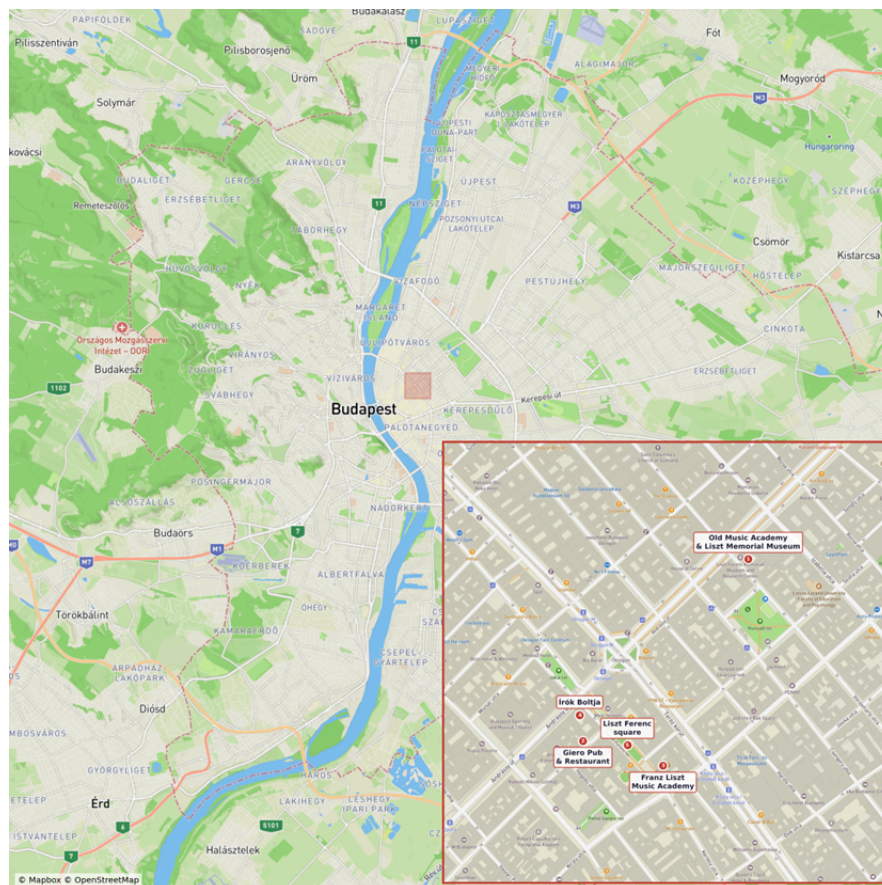


Figure 18. Maps of Budapest itinerary.

Itinerary description:

This itinerary explores the relationship between Hungarian folk traditions and their reinterpretation within classical and art music from the nineteenth century to the present. Structured chronologically, the itinerary connects the work of Franz Liszt with the ethnomusicological research of Béla Bartók, Zoltán Kodály, and László Lajtha, culminating in the Táncház (dance house) tradition—a folk revival movement that began in the 1970s and is now inscribed on the UNESCO Intangible Cultural

D 3.1

Design of Itineraries and Scenarios

Heritage list. Concentrated within a compact urban area, the itinerary encompasses key institutions, cultural venues, and public spaces, offering a narrative that highlights both the transformation and occasional misinterpretation of folk music. Through the integration of archival materials, live performance, and digital storytelling, it provides an accessible and immersive exploration of Hungarian musical heritage.

Main stops of the itinerary and selected objects:

- Liszt Memorial Museum and Music Academy;
- Giero Pub;
- B. Bartók-related spaces;
- Írók Boltja;
- Liszt Ferenc Square.

Objectives:

- to explore the evolution of Hungarian folk music;
- to clarify distinctions between folk and “Roma” music;
- to connect biographies, institutions, and practices;
- to provide immersive storytelling.

Challenges:

- misinterpretation of musical traditions;
- copyright issues;
- budget constraints.

Collaborations: Franz Liszt Academy, Liszt Museum, Hungarian Heritage House, Institute for Musicology.

2. Musical and Cultural Heritage

Musical genres: Hungarian folk and folk-inspired art music.

Social impact: strengthens cultural identity and participation.

Key figures: F. Liszt, B. Bartók, Z. Kodály, L. Lajtha.

Relevant events: Dance House Day, urban festivals.

Instruments: violin, viola, double bass, cimbalom, tárogató.

3. Connected Arts and Objects

Connected arts: dance, theatre.

Objects: music manuscripts, instruments, live and studio recordings.

Locations: museums and archives in Budapest.

4. Immersive Technologies

VR: reconstruction of Liszt's study.

AR: QR-based storytelling.

Online: 360° tours and archives.

On-site: mobile access and headphones.

Impact: accessible and engaging experience.

III.8 A Journey Through Georgian Polyphonic Traditions

1. Itinerary, Sites, and Their Potentialities

Itinerary name: A Journey Through Georgian Polyphonic Traditions.

Type of itinerary: Musical genre-based (traditional polyphony) and territorial.

Leader partner: [GEORGIA Folk Life](#) .

Location(s): Guria and Kakheti regions (Georgia).

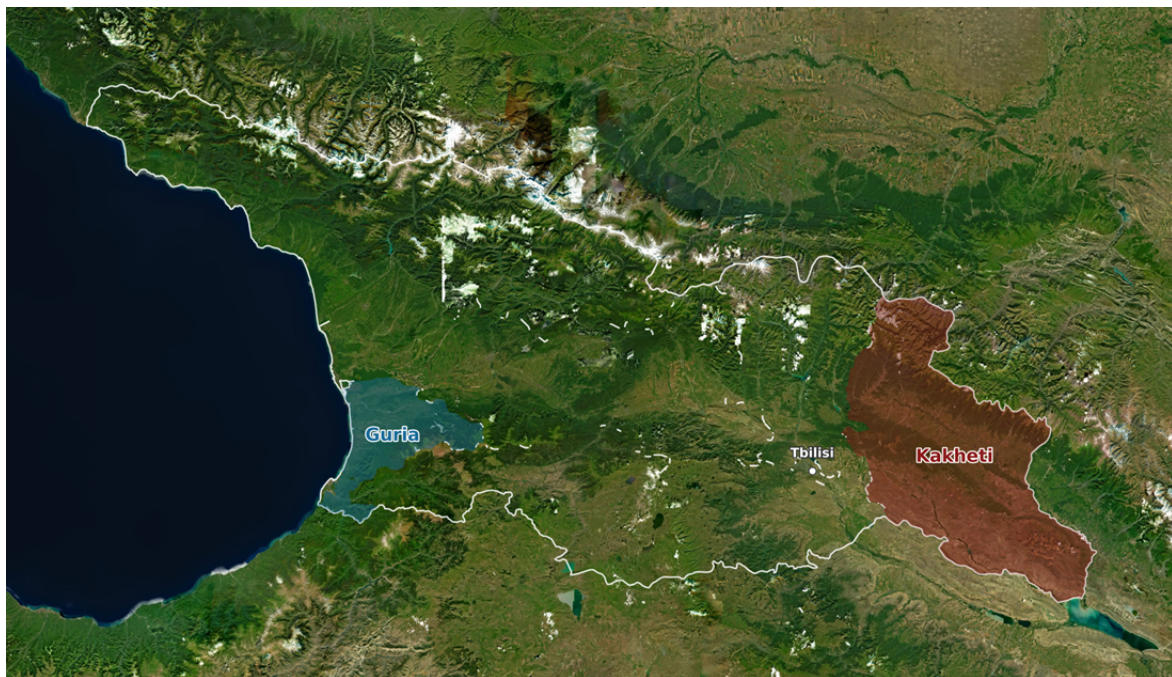


Figure 19. Map of Georgian polyphony journey.

Itinerary description:

This itinerary explores Georgian traditional polyphonic music as a living cultural practice rooted in everyday social, spatial, and ritual contexts. Focusing on the Guria and Kakheti regions, it highlights a variety of vocal techniques, musical practices, and performance settings. Combining territorial and genre-based approaches, the itinerary reconnects Georgian polyphony with its original environments—domestic spaces, communal gatherings, outdoor work settings, and churches—while also addressing its transformation into staged performances. Through immersive documentation, interviews, and contextual storytelling, it offers a critical and experiential understanding of the relationship between music, place, and community.

Main stops of the itinerary and selected objects:

- Guria region: work songs, complex polyphony, Krimanchuli technique;

D 3.1

Design of Itineraries and Scenarios

- Kakheti region: drone-based polyphony and ritual singing;
- domestic and communal spaces (houses, feasting contexts);
- outdoor working environments (fields, vineyards);
- churches and liturgical contexts.

Objectives:

- to document and contextualise living polyphonic traditions;
- to reconnect music with its social and spatial environments;
- to support transmission and cultural visibility;
- to develop immersive and context-sensitive storytelling.

Challenges:

- use of private or semi-private spaces;
- limited visibility of living traditions;
- reconstruction of lost or radically transformed performance contexts;
- urgency of documentation due to ageing tradition bearers.

Collaborations (partners, institutions): PlaceMUS XR consortium (PI Eva Pietroni), Folklife Georgia, local singers and communities, Caucasus University, cultural institutions and archives.

2. Musical and Cultural Heritage

Musical genres: traditional Georgian polyphonic singing.

Social impact: the itinerary strengthens community cohesion and intergenerational transmission; it also preserves intangible cultural heritage and local identities.

Key figures (composers, performers, patrons): local singers, tradition bearers, ethnomusicologists, ensemble leaders.

Relevant events: rituals, feasts (Supra), seasonal traditions (Alilo), work-related practices, church services.

Instruments: primarily vocal; occasional use of musical instruments (chonguri, panduri), and drums.

Historical recordings: archival field recordings and contemporary documentation.

3. Connected Arts and Objects

D 3.1

Design of Itineraries and Scenarios

Connected arts (visual arts, performance, etc.): dance, ritual practices, communal performance traditions.

Objects and collections: audio/video recordings, field documentation, photographs, ethnographic materials.

Authors / creators: researchers, ethnomusicologists, performers, community members.

Locations of objects: archives, museums, libraries, and sites selected for the project's fieldwork.

4. Immersive Technologies

VR: reconstruction of performance contexts and environments.

AR: contextual storytelling and access to recordings and documentation.

Online accessibility: digital platforms integrating archival and newly produced materials.

On-site experience: context-sensitive solutions adapted to domestic, outdoor, and sacred environments.

Expected impact on visitor engagement: enhanced understanding of music as a social and cultural practice; increased awareness of intangible heritage and its transformation.

III.9 Exploring the Evolution of Harmony in Popular Music in UK

Itinerary name: Exploring the Evolution of Harmony in Popular Music in UK.

Type of itinerary: musical genre-based (pop).

Leader partner: [Open University](https://openuniversity.ac.uk/).

Location(s): UK-based and partner venues.

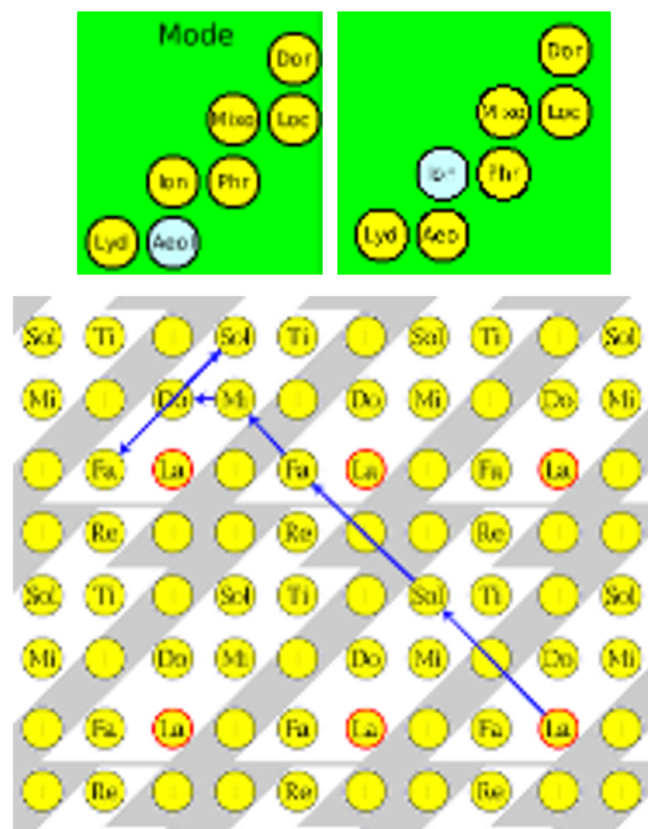


Figure 20. Example of emotional journey from aimlessness to reassurance: *Sultans of swing* (Dire Straits 1978). The labels in this diagram accord with the English-speaking pedagogical moveable-doh sol-fa tradition, rather than the romance language fixed doh tradition.

Itinerary description:

This itinerary explores the evolution of harmonic structures in popular music from the 1960s to the present through an innovative, non-territorial approach. Rather than focusing on physical sites or objects, it presents harmonic progressions as spatial and interactive musical journeys. Using tools developed by the Music Computing Lab, users can visualise, manipulate, and experience chord sequences in dynamic ways. The itinerary offers an inclusive and playful exploration of musical

Design of Itineraries and Scenarios

structure, enabling both experts and non-specialists to understand and create harmonic patterns. It highlights key transformations in popular music while fostering active engagement through interactive and accessible technologies.

Main stops of the itinerary and selected objects:

- interactive harmonic space (digital environment);
- selected popular songs exemplifying harmonic evolution;
- workshop and/or installation environments in partner venues.

Objectives:

- to explore the evolution of harmony in popular music;
- to enable inclusive and interactive engagement with music;
- to visualise and manipulate harmonic structures;
- To support creative experimentation and learning.

Challenges:

- limited connection to physical heritage sites;
- need for accessible and intuitive interfaces;
- dependence on partner venues for implementation.

Collaborations (partners, institutions): Music Computing Lab (Open University), National Museum of Popular Music in Liverpool (The British Music Experience), cultural and accessibility partners.

2. Musical and Cultural Heritage

Musical genres: English popular music (1960s–present).

Social impact: the itinerary promotes inclusive participation in music-making and understanding; supports accessibility and creative engagement.

Key figures (composers, performers, patrons): major popular music artists (various).

Relevant events: workshops, exhibitions, and partner-led events.

Instruments: digital interfaces, controllers, and audio systems.

Historical recordings: optional use of existing recordings; focus on chord sequences.

3. Connected Arts and Objects

Connected arts (visual arts, performance, etc.): digital arts, interactive media, performance.

Design of Itineraries and Scenarios

Objects and collections: harmonic sequences and digital representations.

Authors / creators: popular musicians, researchers, and developers.

Locations of objects: digital environments and partner venues.

4. Immersive Technologies

VR: not central but potentially applicable.

AR: not central but potentially applicable.

Online accessibility: web-based interactive tools and platforms.

On-site experience: interactive installations and workshops with accessible interfaces.

Expected impact on visitor engagement: high level of accessibility and participation; enhanced understanding of musical structures through interaction and play.

Conclusions

The design of the PlaceMUS XR itineraries constitutes an experimental, multidisciplinary laboratory for the study and promotion of European heritage, with particular emphasis on its musical dimension. These itineraries enable the reuse of data from past initiatives, the generation of new data, and their dissemination through European cultural heritage platforms. All itineraries address the challenge of presenting music as an intangible, performative, and time-based art.

In sum, the design of the itineraries generally takes into account the following elements:

- the concept of *digital journey*;
- *personalisation of the experience*: the possibility, for the users, to choose the most suitable tools to access places of music in ways that suit their needs and environment;
- *customisation of content*: the possibility, for the users, to customise content and its level of specificity, in accordance with their interests and background;
- different scales of representation, information levels, and media integrated within a coherent structure and storytelling;
- *accessibility*: experience built on engaging activities to learn and interact with harmony, rhythm, and tunes, suitable for everyone, regardless of physical disability or lack of musical training;
- integration of 1) structure of the information, 2) story maps, and 3) knowledge graph;
- *re-usability of tools* to create new itineraries and scenarios by abstracting a general framework and templates from specific solutions and prototypes;
- *release of editorial guidelines* to enable creative teams to expand European musical itineraries with new content and scenarios.

Across all itineraries, music is approached as a phenomenon shaped by the architectural, social, and cultural environments in which it was written, performed, and experienced. The project connects sound to places, practices, and communities, allowing musical heritage to be experienced as a spatial and relational phenomenon rather than as decontextualised repertoire. All nine case studies employ this multidisciplinary approach: music in the Loire Valley and Ferrara is connected to courtly, liturgical, and urban spaces, while the safeguarding of intangible heritage—such as Cremonese violin making, Georgian polyphony, and the Hungarian Táncház movement—is also considered in its cultural and historical dimensions.

D 3.1

Design of Itineraries and Scenarios

The report examines recent digital tools and immersive technologies for cultural heritage, alongside challenges related to historical accuracy and reconstruction (sound, images, spaces). It also emphasises the sustainability of digital infrastructures, highlighting the need for methodological and ethical frameworks to ensure transparent and adaptable digital representations.

By encouraging users to explore structures, gestures, and soundscapes through interaction, the PlaceMUS XR itineraries aim to demonstrate how digital environments enable participatory engagement. This applies to both site-based experiences, such as reconstructed acoustic environments and museum installations, and to conceptual itineraries, where music is treated as an interactive space. By accommodating different user profiles, including non-specialist audiences and users with impairments, the itineraries' design supports an inclusive approach to cultural heritage.

Glossary

3D semantic annotations: Descriptive information attached to elements within a 3D model that identifies their meaning, properties, or relationships, enabling better understanding, interaction, and analysis of the object.

Archicembalo *clavmusicum omnitonum*: Invented by Nicola Vicentino around 1555), it is a harpsichord with extra keys allowing finer distinctions between pitches to resemble the Ancient Greek genera.

Ambisonic microphones: Ambisonics is a technique for capturing, synthesizing, and reproducing sound environments. It enables listener immersion through multiple loudspeakers, typically ranging from a few to several dozen. The method exists in both 2D, with speakers arranged on a horizontal plane, and 3D, with speakers distributed around the listener on a spherical layout.

ART4SEA: An interdisciplinary project or initiative focused on using art and digital technologies to explore, represent, and raise awareness of the sea and marine environments, often combining cultural heritage, environmental themes, and immersive media.

ATON: An open-source framework based on Node.js and Three.js designed, developed and coordinated by B. Fanini (DHILab, CNR ISPC—ex ITABC) to create Web3D/WebXR apps (e.g., presenters, applied games, tools) interacting with CH objects and 3D scenes on the Web.

Binaural recording: a recording method that uses two microphones, arranged with the intent to create a 3D stereo sound sensation for the listener of actually being in the room with the performers or instruments.

Castrato: male singer who underwent castration before puberty to preserve a high vocal range, who performed leading roles in opera and sacred music especially in the eighteenth century.

Client-side Presentation Layer: The part of a software system that runs in the user's device (such as a browser or app) and is responsible for displaying information and handling user interaction.

Cubiculum musicae: An audiovisual installation developed by Ricercar Lab (the musicology programme of the Centre d'études supérieures de la Renaissance—UMR 7323), designed to promote and reconstruct musical heritage within cultural sites. <https://zenodo.org/records/15427868>

ECCCH: European Cloud for Heritage OpEn Science (ECHOES) is an initiative that creates a shared digital platform to connect, preserve, and provide access to Europe's cultural heritage data, tools, and expertise. <https://www.echoes-eccch.eu/>

Design of Itineraries and Scenarios

Embodiment: The process of making heritage, knowledge, or artworks physically and experientially present through the body, space, and sensory engagement, so that visitors understand them not only intellectually but also through lived, sensory experience.

Generative AI: A type of artificial intelligence that creates new content—such as text, images, music, or video—based on patterns learned from existing data.

GeoViz (Geovisualisation): A set of techniques and representation paradigms to visualise and explore information about a spatio-temporal phenomenon occurring on a territory. It employs cartographic communication and implements other abstractions about the territory.

GIS: A geographic information system consisting of integrated computer hardware and software that store, manage, analyse, edit, output, and visualize geographic data.

Head Mounted displays (HMDs): Wearable devices placed on the head that present visual content directly in front of the eyes, often used for virtual or augmented reality experiences that immerse the user in a digital or mixed environment.

Heritage object: Artifact, artwork, document, or monument that holds cultural, historical, or scientific significance and is preserved as part of our shared heritage.

High-performance hardware: advanced computing equipment (e.g. powerful processors, GPUs, and supercomputers) designed to perform complex calculations and process large amounts of data at very high speed.

Intangible heritage: non-physical traditions and living expressions—such as oral traditions, performing arts, rituals, languages, and craftsmanship skills—that communities recognize as part of their cultural identity and pass down through generations.

Madrigal: A type of secular vocal music from the Renaissance, usually for several voices singing together without instruments, in which the music often closely reflects and depicts the meaning and imagery of the poetic text through expressive writing and interwoven melodic lines.

MEI (Music Encoding Initiative): System for encoding musical documents in a machine-readable structure <https://music-encoding.org/>

Mesh geometry: a digital representation of a 3D object made up of interconnected points, edges, and faces that together define its shape and structure.

Minerva: Integrated into Aton, a framework based on Aton for the creation of 3D scenarios

NFC tags (Near Field Communication tags): Small wireless chips that store data and can be read or written by nearby devices (such as smartphones) when brought very close, enabling quick data exchange or interaction without physical contact.

D 3.1

Design of Itineraries and Scenarios

“One-to-many” model: In systems analysis, a one-to-many relationship is a type of cardinality that refers to the relationship between two entities where one instance of the first entity can be associated with multiple instances of the second, but not the reverse (see also entity–relationship model).

Opera: A form of theatrical performance in which a dramatic story is told through music, combining singing, orchestral accompaniment, acting, and often stage design.

Phygital (physical + digital) refers to the integration of physical and digital experiences into a unified environment.

Polyphony: Music in which two or more independent melodic lines are heard at the same time, each with its own rhythm and contour, forming a single musical texture.

Semantic characterisation: The process of encoding data within a structured ontological framework (such as CIDOC CRM) to define its meaning, relationships, and context in a standardized and interoperable way.

Stereophonic: A method of sound reproduction using two or more audio channels to create a sense of spatial depth and direction, making sound appear as if it comes from different positions.

Spatial UI design is a new and emerging field that is focused on creating user interfaces that interact with the physical world in a natural and intuitive way.

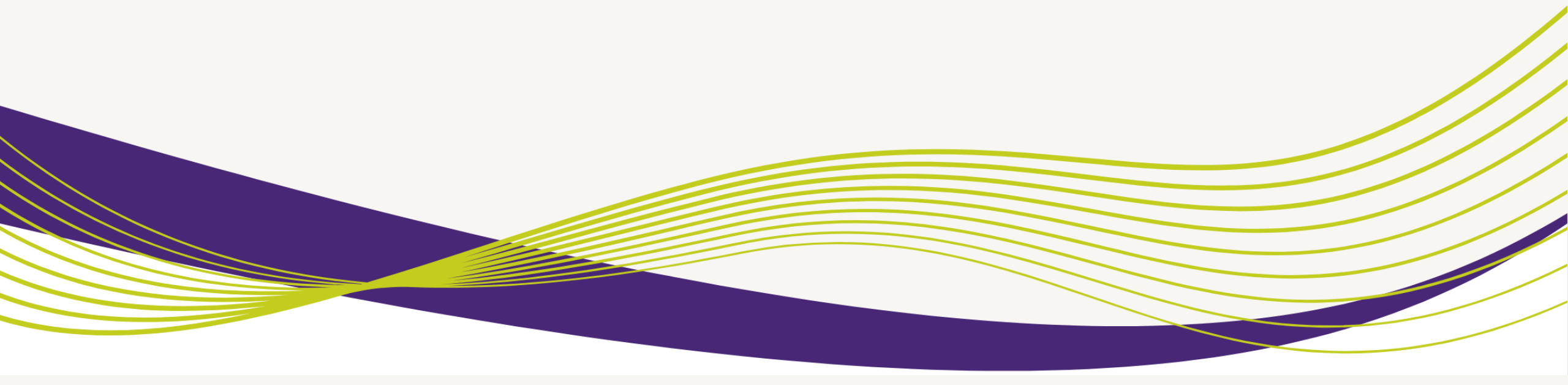
Web3D Scene Editor framework: A web-based software framework used to create, edit, and manage interactive 3D scenes that can be viewed and explored directly in a web browser.

WYSIWYG (what you see is what you get): It is a software that allows content to be edited in a form that resembles its appearance when printed or displayed as a finished product, such as a printed document, web page, or slide presentation.

Annex 1 Information Architecture

WP3

Itineraries and Scenarios [M2-17]



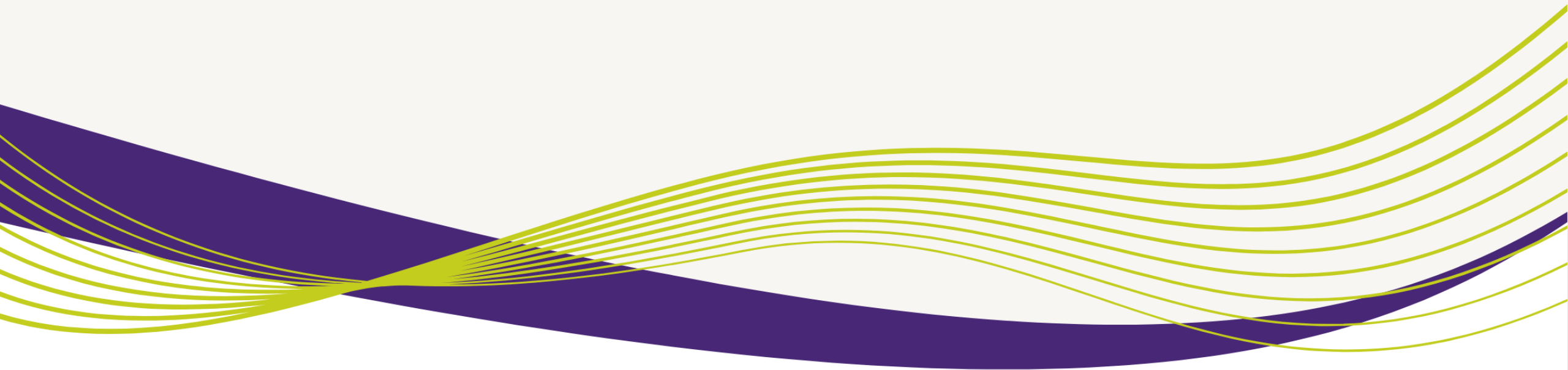
WP3

Itineraries and Scenarios

Information architecture



MUSICAL GENRE BASED ITINERARY





**Musical Genre based
itinerary
INTRODUCTION**

Es. Madrigale

WHAT this
musical genre
is

WHERE
(country, city,
countryside)

WHEN

WHO:
actors, owners
musicians patrons,
interpreters,
public

WHY IT
IS IMPORTANT

WHICH PLACES
IT INVOLVES:
palace, church,
museum, private
houses, fields

MAIN 4 PLACE
REPRESENTATION

MUSICAL
INSTRUMENTS

Interpretation
paradigms
(link to youtube)

WHAT
behaviours
of musicians
and public,
positions,
gestures

HOW LONG
(Concert
formula)

HISTORICAL
CONTEXT
society, politics,
economy

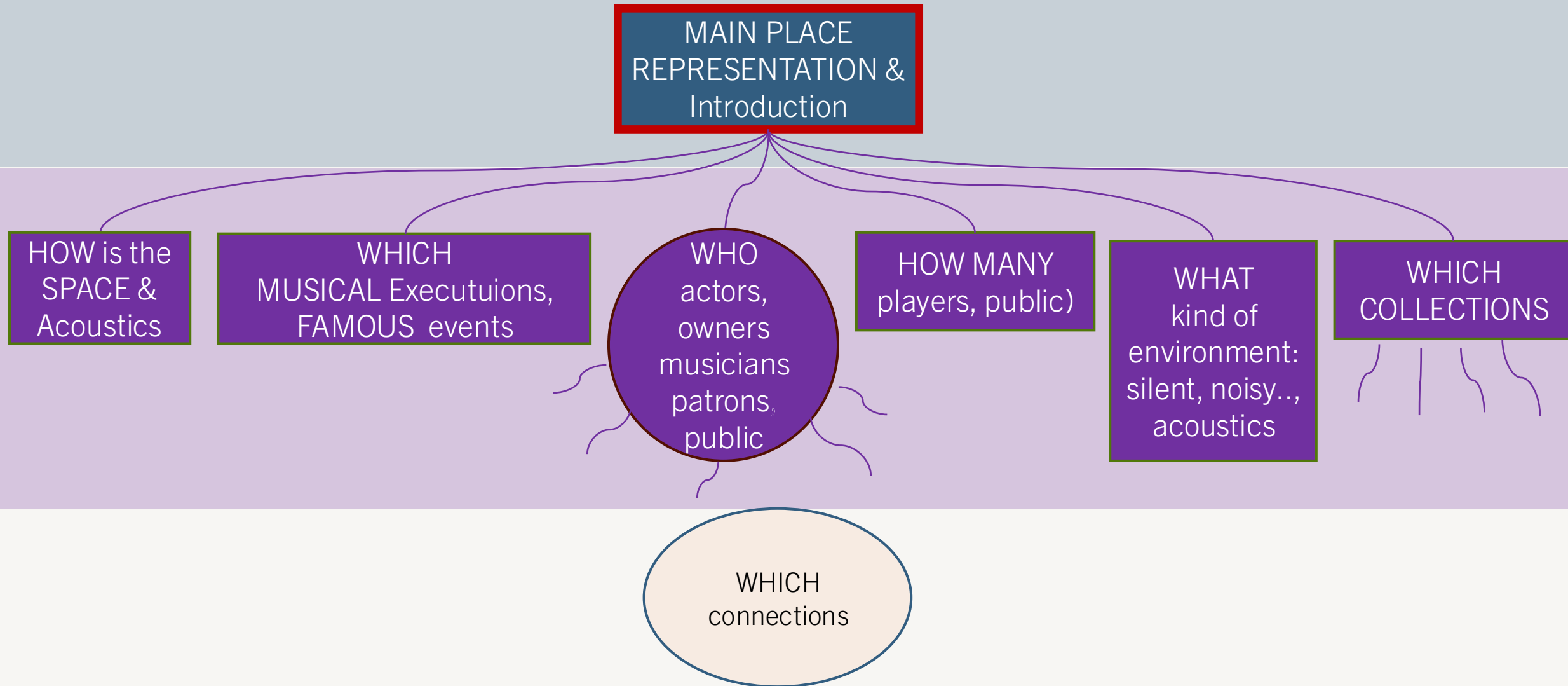
WHY (function),
IMPACT ON
SOCIETY, tastes
and trends

WHICH
Connections: other
arts, regions,
traditions, peoples

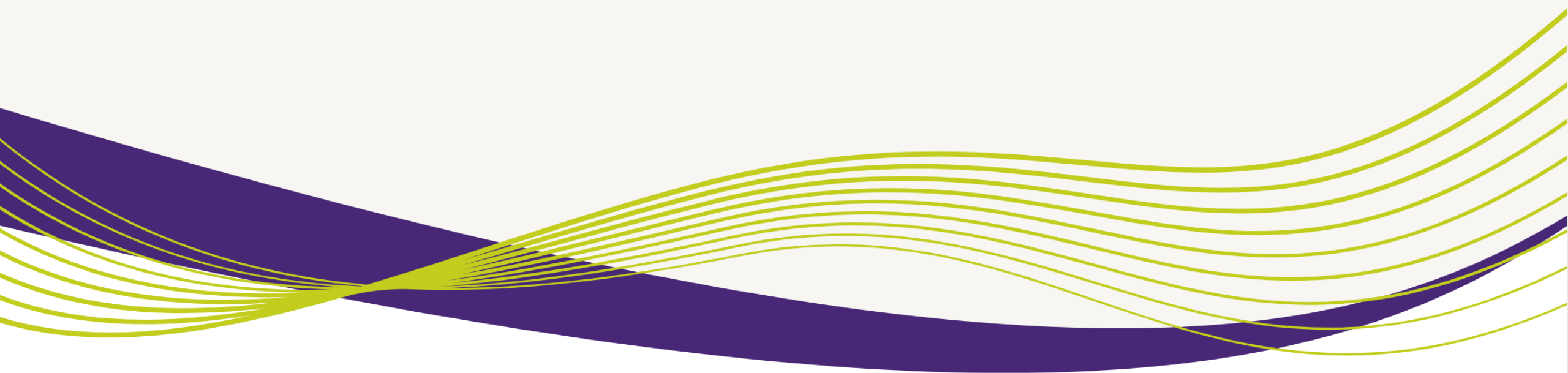


Musical Genre based itinerary INTRODUCTION

Es. Madrigale



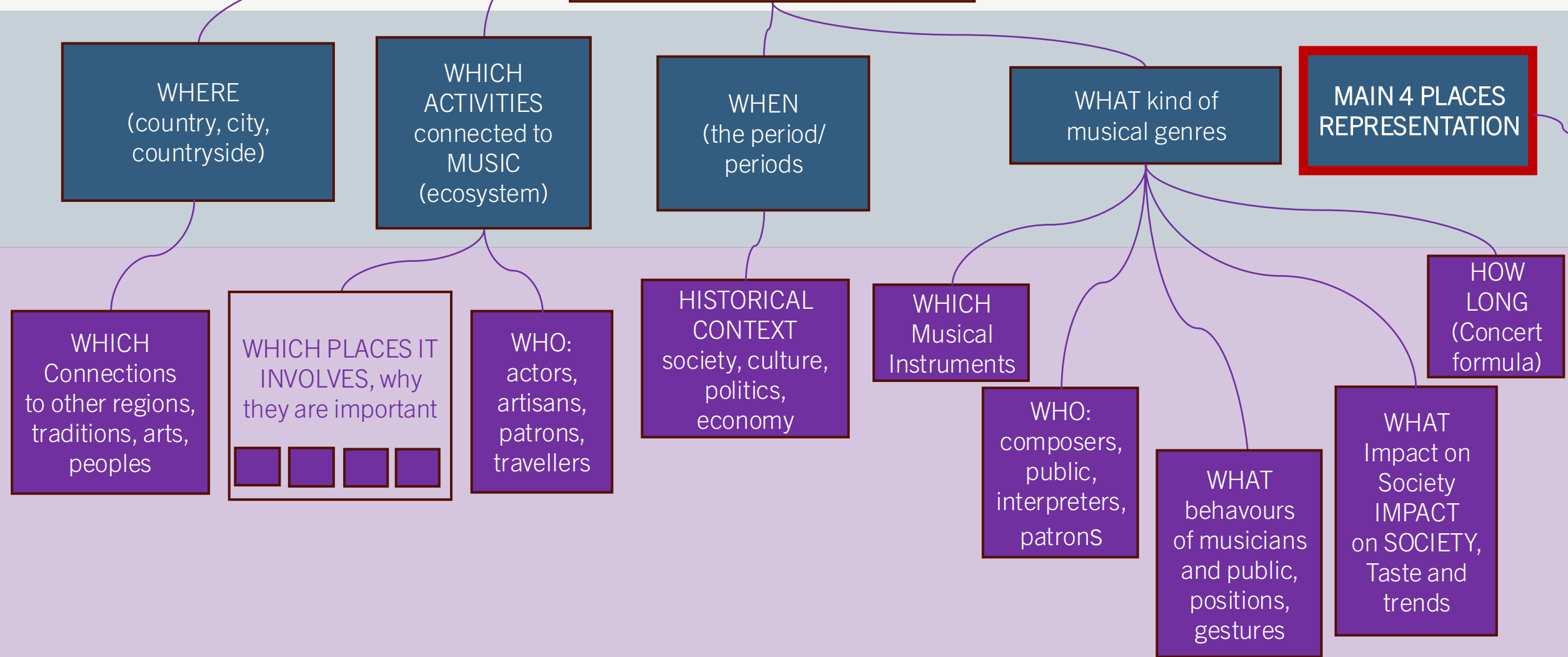
TERRITORIAL ITINERARY





Territorial Itinerary INTRODUCTION

Es. Places of Music in Ferrara

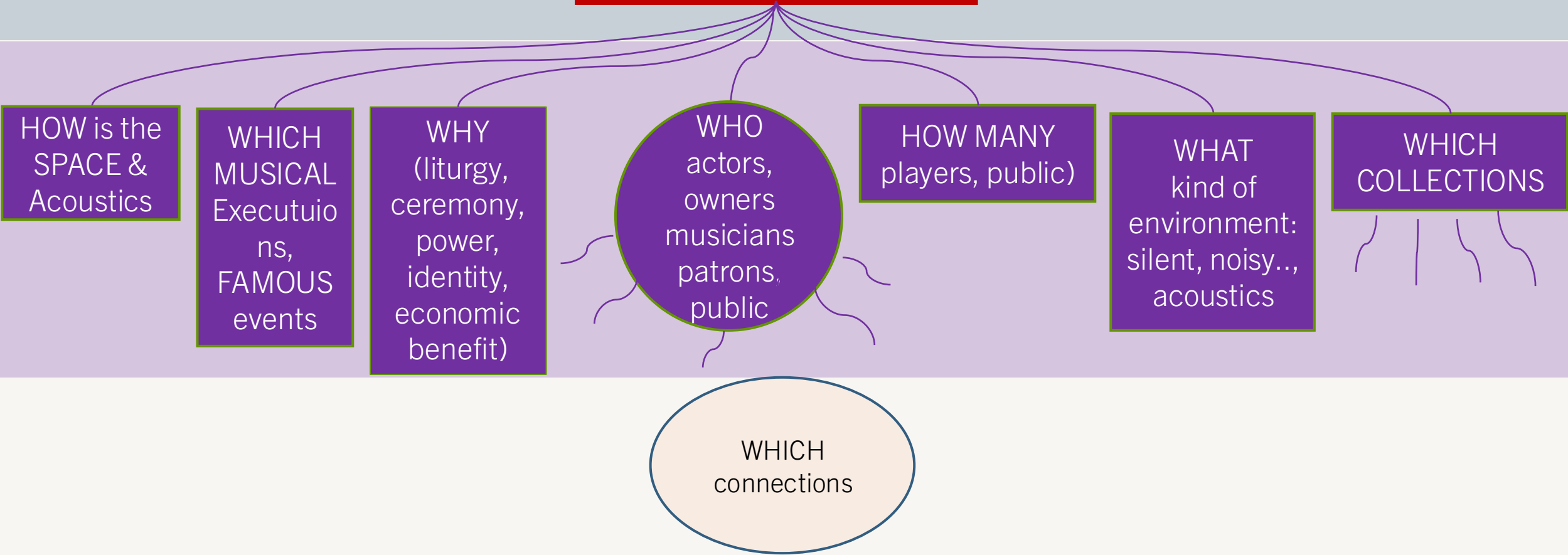




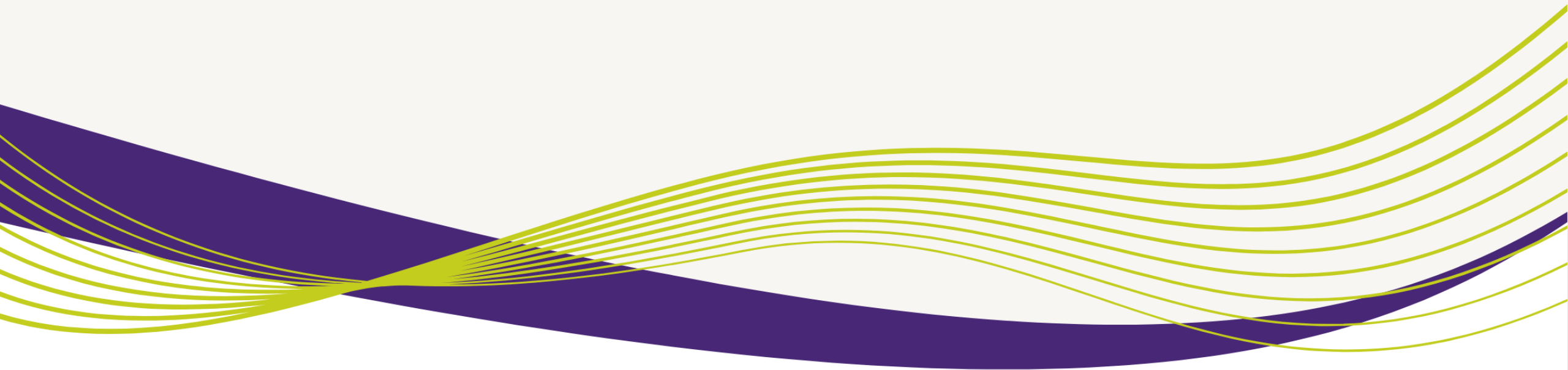
**Territorial Itinerary
INTRODUCTION**

Es. Places of Music in Ferrara

**MAIN PLACE
REPRESENTATION &
Introduction**

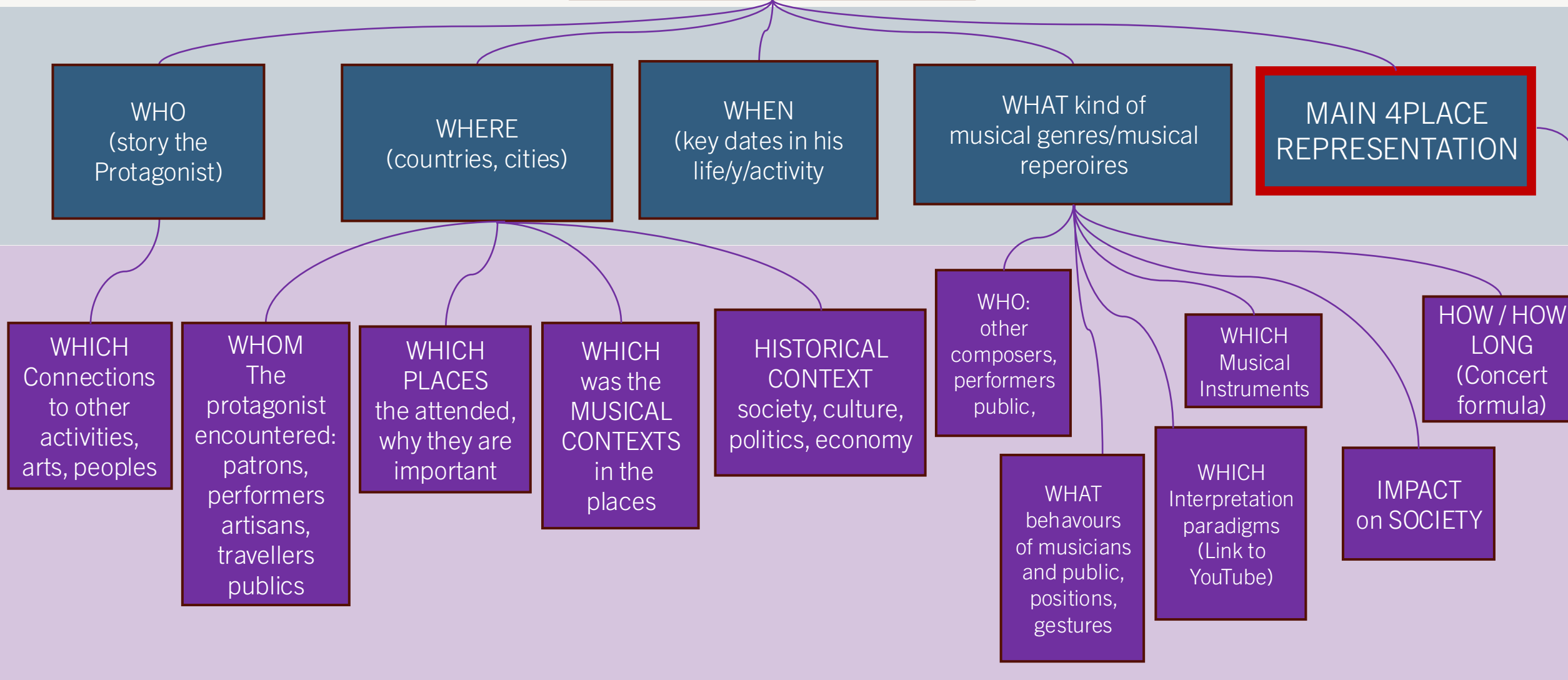


BIOGRAPHICAL ITINERARY





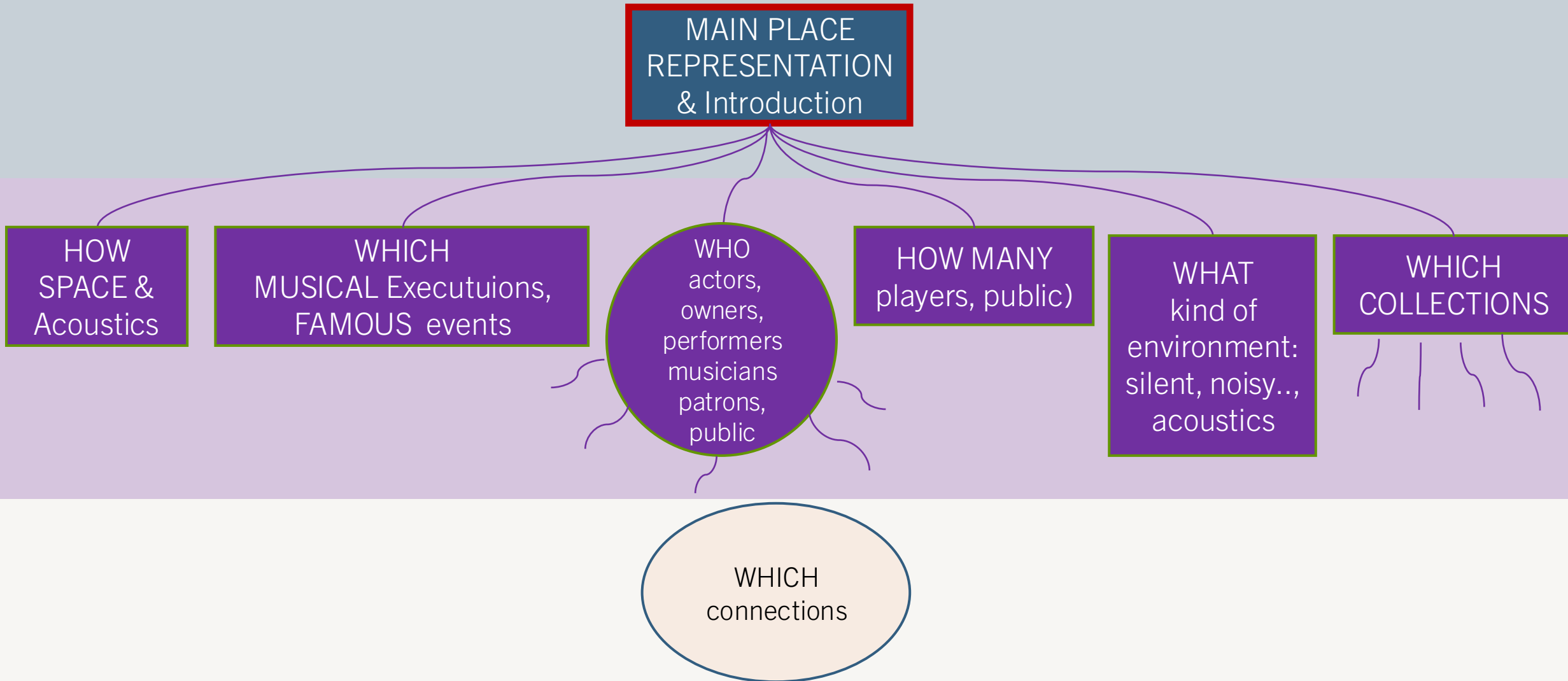
**Biographical Itinerary
INTRODUCTION**



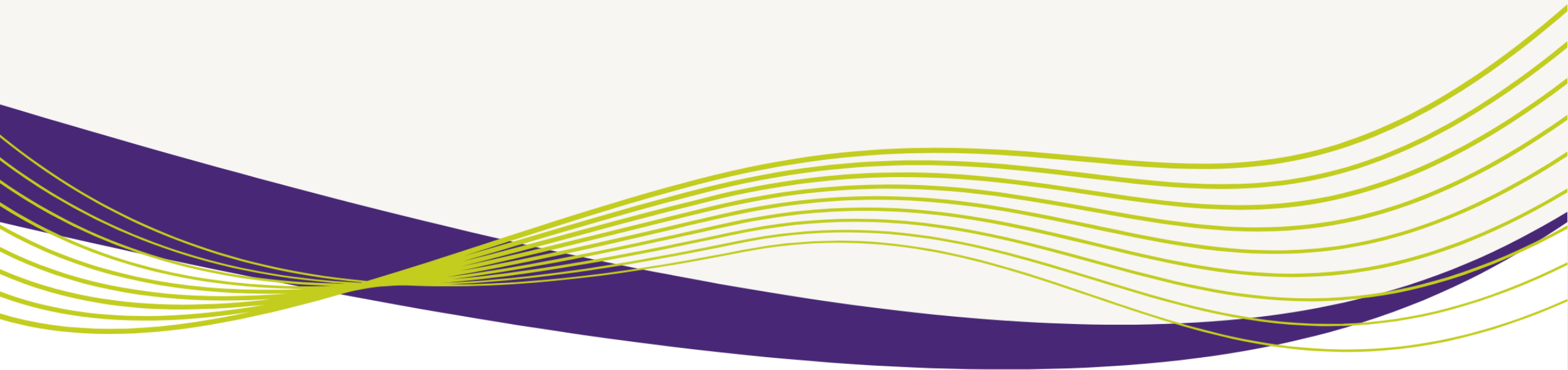


Biographical Itinerary INTRODUCTION

Es. Morricone



SITE SPECIFIC ITINERARY





**SITE SPECIFIC
Itinerary
INTRODUCTION OF THE PLACE**

Es. a Castle

WHEN
HISTORY
OF THE PLACE,
life cycles
transformations,
owners

WHO
actors,
owners
musicians
patrons,
public

WHERE
(countries,
city)

HISTORICAL
CONTEXT
society,
culture,
politics,
economy

WHICH
the MUSICAL
CONTEXTS
in the
city/region

WHICH
connections



**SITE SPECIFIC
Itinerary
ROOM EXPLORATION**

Es. A castel, an abbey

