Funded by
the European Union

European
Commission

Project ID: 101132488
Start date: October 1st, 2024
Duration: 36 months

META-MUSEUM

***M**oving **E**motions towards confidence in the **T**ransformative **A**ppropriation for a **M**eaningful **U**nderstanding of cultural heritage: a neuro**S**cientific approach to **EU**ropean **M**useums*

DELIVERABLE D1.3

TITLE Data Management Plan

Due date: 31 March 2025
Actual submission date: 28 March 2025
Number of pages: 17

Lead beneficiary: Politecnico di Torino - POLITO
Involved partners: All partners

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DISSEMINATION LEVEL ☒ PU - Public ☐ SEN - Sensitive

TYPE
☐ R - document, report
☒ DMP - Data Management Plan
☐ DATA - Data sets, microdata, etc
☐ DEM - Demonstrator, prototype
☐ OTHER

DELIVERABLE REVIEW HISTORY

VERSION	DATE	DETAILS
0.1	17 Feb 2025	1st draft - initial version
0.2	3 Mar 2025	Draft shared with partners involved
0.3	10 Mar 2025	Draft for review process
0.4	25 March 2025	Integration of comments
0.5	28 March 2025	Final version

LIST OF ABBREVIATIONS

ACRONYM	DESCRIPTION
DMP	Data Management Plan
GDPR	General Data Protection Regulation
FAIR	Findable, Accessible, Interoperable, Reusable
TMt	TransforMeans theory
CH	Cultural Heritage
EMP	Ethics Management Plan
AI	Artificial Intelligence
WP(s)	Workpackage(s)
DEL(s)	Deliverable(s)
MIL(s)	Milestone(s)
UWB	Ultra-Wide-Band
GSR	Galvanic Skin Response
EEG	Electroencephalography
EDA	Electrodermal Activity
HRV	Heart Rate Variability

Related Documents	Location
D1.1 Management Plan	MS Teams location
D2.1 Ethics Management Plan	MS Teams location

Contents

Introduction

The Data Management Plan (DMP) ensures a high level of data quality and accessibility for end users, through the specification of data and metadata formats and protocols, data sharing, archiving and storage, security, privacy, intellectual property and issues related to the General Data Protection Regulation (GDPR). META-MUSEUM DMP will be updated and enriched throughout the project development. The data and project results will be managed according to the "FAIR" (Findable, Accessible, Interoperable, Reusable) approach, as specified in the Horizon Europe guidelines on open data.

1. Data Summary

1.1 *Data description and metadata*

The META-MUSEUM project's data collection procedures will be carried out through the expertise and collaboration of multiple partners, each contributing specific methodologies and datasets to ensure a thorough and ethically sound approach. The process will be designed to meet the project's objectives while upholding the highest ethical standards, including the protection of participants' rights and the integrity of collected data.

As stated in deliverable D1.2 Ethics Management Plan, data will be collected through the following types of activities:

- Dissemination of customized questionnaires and implementation of individual interviews both in person and online.
- Implementation of indoor positioning tests.
- Neurophysiological parameters measurements during cultural heritage experiences in cultural and non-cultural contexts (museums, hospitals, and hybrid environments)
- Laboratory-Based Investigations aiming at recreating a scaled-down version of the museum experience in a controlled laboratory setting.
- Examination linkage between the density of 2274 cultural heritage management keywords from documents found via Google Search and 34 macro environment indicators for 90 countries, developing 2274 neural network models. These models show that cultural heritage management keywords are interconnected with the examined countries' cultural, social, economic, political, and environmental dimensions.
- Participatory and co-creation activities thanks to the use of attaCHbox App (T4.4). During P1, P2, and P3, participants will be invited to share their interpretations of the cultural experience they have just encountered—whether through "meaning creation" or "role-playing" related to the event.

Observation of museum visitors' behaviour, and people experiencing cultural heritage in other settings

Data generated through META-MUSEUM will be limited to the scopes of the project and different data types, including experimental, observational, images, text, and numerical data, will be collected:

- Baseline demographics (age, sex, etc.)
- Qualitative and quantitative data on participants' engagement with cultural heritage experiences
- Qualitative and quantitative social, cultural, political, economic, environmental and Google data on countries' engagement with cultural heritage experiences
- Social media statistics recording shares, likes and other forms of engagement with P3 – hybrid event and content shared on social media

- Interview video/audio recordings, reports and transcripts
- Movement trajectories, time spent at exhibits, and interaction points
- Neurophysiological data/parameters (EEG and GSR dataPsychometric scales
- Movement data: movement-related emotional responses, such as approach-avoidance tendencies and postural freezing.
- Data on emotional states, arousal, valence, physiological states (EEG, GSR, HRV, respiration, body temperature, etc.).
- User-generated content (such as images, videos, audios, etc.)
- Global Google user-generated cultural heritage text content and its multiple criteria and statistical sentiment analysis

For the quantitative data the aim is to achieve adequate statistical power. Therefore an *a priori* power analysis will be conducted and at the end of the project a *post hoc* power analysis will be reported as described in the D2.3 - General Assessment and Interpretation Model. The estimated size of the data will depend on the number of participants involved, the duration of the experiment, and the type of technology employed:

- Laboratory-based investigations (WP5, led by STICHTING VU) will involve about 20 subjects.
- Within WP6 (led by POLITO), the *status quo* and P1 measurements in museums (T6.3 and T6.6) will reach approx. 600 participants (200 persons for each Museum Associated Partner involved).
- Within WP7 (led by UNIROMA1) the P2, *i.e.* experiments in hospitals, META-MUSEUM will involve about 30 participants (T7.3).
- In P3 (WP8, led by VILNIUS TECH) the aim is to monitor the emotional states of 100 people participating to a cultural experience, while on social media the participation cannot be quantified for now (online people will be managed differently, without neurophysiological measurements, but only feedback).

Furthermore, digital storytelling and positioning sensors may generate large amounts of image and numerical data, and wearable devices produce physiological data. The data collected in P3 will be processed and analyzed by VILNIUS TECH, using AI and machine learning algorithms, which may further increase the size of the data. The data will be stored in a secure and reliable repository developed by BEIA to ensure data safety and accessibility.

By integrating these data collection efforts, the META-MUSEUM project will gain a multidimensional understanding of user interactions and responses. The expertise of each partner, combined with strict adherence to ethical standards, will ensure that data collection remains rigorous, respectful, and valuable in achieving the project’s objectives.

The data generated during META-MUSEUM development, thanks to the use of di cutting-edge technologies, such as positioning sensors, wearable (and not) devices, and artificial intelligence - combined with psychological questionnaires to evaluate confidence, well-being, resilience, and anxiety - will be of substantial value to researchers, practitioners, and stakeholders working in the cultural sector. Due to the large set of data to be collected through a plurality of devices and Partners (POLITO, UNIROMA1, STICHTING VU, and VILNIUS, BEIA), the realization of a Data Sharing Agreement will be considered. If needed, it will include information about data ownership, processors, responsibility and eventual data access restrictions.

The data collection process will follow a structured approach:

1. Defining research objectives – Identifying the necessary data types and their relevance to the study.
2. Documenting data requirements – Establishing both qualitative and quantitative data needs.
3. Selecting appropriate methods and tools – Evaluating various data collection techniques based on META-MUSEUM's research goals, assessing their strengths and limitations, and determining the most effective strategy.
4. Ethics Committees approval for data collection protocols.
5. Developing a timeline – Structuring the phases of study design, data collection, analysis, and interpretation while considering available resources and constraints.
6. Designing tools and interpretation strategies – Developing effective data collection instruments and methods for accurate data analysis.
7. Conducting pilot testing – Evaluating the efficiency of the selected tools and refining them based on pilot test feedback to enhance data reliability.
8. Standardizing protocols – Establishing a comprehensive protocol aligned with collected data and pilot test findings to ensure reproducibility.
9. Documenting step-by-step procedures – Creating detailed guidelines for data collection while addressing ethical considerations.
10. Developing an analysis and presentation plan – Identifying statistical techniques to extract meaningful insights from the data.

This systematic approach will ensure the reliability, validity, and ethical integrity of the collected data while supporting META-MUSEUM's objectives.

2. FAIR data

The data will be accompanied by metadata that describes the data's content, provenance, and context, facilitating the discovery and reuse of the data. The data will be stored in secure and reliable repositories, ensuring the data's safety and accessibility. Research data will be openly available (openness by default) and comply with the FAIR principles. Intellectual property rights, specific commercial interests and the protection of personal data and confidentiality will be respected. The creation of content (*e.g.* digital narratives based on the TMt) broadening and deepening the understanding of the CH transformative nature could feed into open database projects such as Wikimedia Commons and Wikidata, by implementing already existing actions of Associated Partners Museums.

Storage and Data Accessibility

BEIA holds primary responsibility for developing and implementing a **secure and scalable data repository** within the META-MUSEUM project. This repository is designed to **facilitate data collection, storage, management, sharing, and reuse** in compliance with the FAIR (Findable, Accessible, Interoperable, Reusable) principles.

1. Ensuring Data Availability and Accessibility

- Data will be stored in a **hybrid cloud infrastructure** (on-premise and cloud-based) to ensure redundancy and global accessibility.
- Data will be accessible based on **authentication mechanisms and fine-grained access control**, ensuring secure user management.
- BEIA's infrastructure will guarantee **high uptime (99.9%)** and **minimal downtime** using failover mechanisms and geographic data replication.

2. Metadata and Interoperability

- BEIA will implement a **standardized metadata system**, using ontologies and formats compliant with **the metadata schema**.
- **Digital Object Identifiers (DOIs)** will be assigned to public datasets, ensuring persistent references and proper citation.
- Data will be **fully compatible with international standards** such as the Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (**INSPIRE**)**,** enabling cross-disciplinary data exchange.

3. Data Sharing and Reuse

- BEIA will facilitate the integration of relevant data into **open databases**
- Sensitive datasets will only be available to **accredited researchers** through a **Data Sharing Agreement (DSA)** outlining access and usage conditions.
- BEIA will ensure that all collected data remains available for at least **five years after project completion**, as required by Horizon Europe archiving policies.

2.1 Making data findable, including provisions for metadata

To ensure the findability of data and research outputs, persistent and unique identifiers, such as digital object identifiers (DOIs), will be used. Trusted repositories, such as Zenodo, Dryad, or Figshare, will also be used to deposit and share the data. The data will be accompanied by metadata that describes the data's content, provenance, and context, facilitating the discovery and reuse of the data. The project website will collect the links to all openly available data.

2.2 Making data accessible

IPR will be considered when sharing the data, and the timeline for open access will be determined based on the ethical and legal framework. The data will be made accessible as soon as possible, adhering to the FAIR principles.

The data collected during the laboratory-based experimental phases of WP5 will include personal and neurophysiological data and will be anonymized following a structured procedure. Each participant will be asked to sign an informed consent form before data collection. At the same time, a unique random alphanumeric code will be assigned to the participant, which will be used in the neurophysiological data collection software and associated questionnaires. The neurophysiological data will be gathered using a portable EEG headset (Mindtooth Touch), electrodermal activity sensors (Shimmer 3 GSR+), and a force plate to measure postural responses such as center of pressure (CoP) displacement. These signals will be recorded and stored locally during the experiments on a secure tablet/desktop. The data will be backed up in a password-protected space dedicated specifically for data backup, ensuring secure storage and protection against data loss. Confidential access to the data will be restricted to relevant project partners, using username and password authentication. Finally, the results of the analyses will be shared within the Consortium and externally only in aggregated form, ensuring full compliance with ethical guidelines and data protection regulations. Under no circumstances will the data be transferred outside the European Union (EU).The data collected during the experimental phases in museums of WP6 will be personal and neurophysiological data, and will be anonymised according to the following procedure: each subject will be asked to sign the informed consent form, and at the same time will be assigned a random alphanumeric code, which will be entered in the neurophysiological data collection software and also in the two questionnaires. The personal data processed by the POLITO is related to informed consent, acquired locally on a password-protected tablet. Original data collected by POLITO members will be transferred in its raw formats, at the end of each experiment session, to a proper POLITO database which is protected by simple encryption algorithms, and no other Partners will be able to access it. The physiological data will be acquired anonymously, using equipment and related software (such as Mindtooth, Shimmer, Pozyx and Tobii). The data will be saved locally during the experiment, on a tablet, and transferred to the server of the technical partner BEIA dedicated to the project, in a specially structured database: each partner who owns the data will have confidential access with a username and password to the database where the data will be uploaded with only the alphanumeric identification code. In the database, which can only be accessed by POLITO and UNIROMA1, each subject will be identified exclusively by the random alphanumeric code and therefore it will not be possible to trace the identity of the individual subjects. The data collected in the experiments in the museums will be accessible only to the partners POLITO and UNIROMA1, where the use of alphanumeric codes will be exclusively instrumental to the correspondence between neurophysiological tracing and questionnaires. The results of the analyses will be disclosed within the Consortium as well as externally only in aggregate form. Under no circumstances will the data be transferred to countries outside the EU.

The database will be accessible according to a sophisticated role-based **access control system** that is implemented with the following hierarchy:

a) **System Administrator:**

- Full system access
- Database management capabilities
- Security configuration
- User management
- System monitoring and maintenance

b) **Research Administrator:**

- Access to anonymized datasets
- Analysis tool management
- Report generation capabilities
- Data export permissions
- Query optimization tools

c) **Data Operator:**

- Data entry permissions
- Basic data modification rights
- Quality control tools
- Standard report access
- Basic analysis capabilities

d) **General User:**

- Public data access
- Basic visualization tools
- Standard report viewing
- Limited export capabilities
- Personal data management

Open Science infuses throughout the whole methodology of META-MUSEUM. Open Science practices will be adopted to share with other wider networks, other researchers and all citizens the project's activities, contents and results. An open cooperative work and systematic sharing of knowledge and tools will be practiced as early and widely as possible. **Open Access** and **Citizen Science** (collaboration with citizens) are the basis of the "circular culture", by enabling cultural institutions to overcome the top-down approach, taking into account citizens' contributions. Data open access can contribute to the dissemination even after the project has ended, involving other institutions interested in the project. During META-MUSEUM implementation, data will be stored and managed in an inclusive way, via open files and open platforms. The citizens' contribution will be crucial to the project's progress in the collection of pilots' data. The contribution will be *indirect,* relating to neuroscientific measurements and profiling of participants through questionnaires, and *direct,* relating to participatory activities during the Pilots, where participants will be invited to create and share contents. Regarding **science communication**, in accordance with the version 1.1 of "Horizon Europe (HORIZON) Euratom Research and Training Program (EURATOM)" - General Model Grant Agreement (HE MGA - Multi & Mono), all **scientific articles** will be deposited and released with a CC BY license (PSi Directive 1024/2019) as soon as possible or, at the latest, on the date of publication and immediate **open access** will be guaranteed. In this context, on the project web site free open access will be given for articles related to project results. Furthermore, all of the scientific project results will be made accessible on IRIS, (https://iris.polito.it/) the Coordinator's Open Repository of publications produced by the scientific community of POLITO where publications bibliographic data can be provided with their open access full-texts. IRIS has got a promoting and leading role in getting research products to become accessible and shareable. Other Partners' repositories include the e-Scholar permanent data repository at the Manchester University Library.

Within the META-MUSEUM project, efficient data management plays a critical role in achieving the established objectives, with BEIA holding primary responsibility for curating, storing, and preserving the generated data. This task involves developing and implementing a data storage system that ensures data quality, security, and integrity, as well as compliance with legal requirements and relevant international standards.

The **data storage system** is designed to collect and organize information from various experimental sources, including sensor-generated data, questionnaires, and other tools used in the project. Each dataset undergoes a rigorous process of validation and preprocessing to ensure consistency and accuracy before storage. To meet these requirements, the database is designed to be scalable, enabling the efficient integration of new data types or sources throughout the project lifecycle.

Data security and confidentiality are fundamental priorities in the storage process. Data is protected through the implementation of advanced measures, such as encryption of sensitive information and the use of an authentication system for controlled access. These measures align with data protection regulations, such as GDPR, ensuring legal compliance and safeguarding information against unauthorized access. Additionally, robust periodic backup procedures are in place to prevent accidental data loss. Backup copies are systematically managed, and rapid recovery mechanisms ensure operational continuity even in the event of unforeseen incidents.

In the long term, the storage infrastructure is designed to be durable and accessible, ensuring not only the preservation of data but also its reusability for future research. This aspect is essential for fully leveraging the project's results and facilitating their use by the scientific community and other stakeholders. All these elements are integrated into a comprehensive data governance framework that defines clear rules for accessing, using, and protecting stored information.

To ensure that the Spatial Data Infrastructures of this project are compatible and usable in a community and transboundary context, the INSPIRE Directive has been adopted. One of the major goals of INSPIRE is to create harmonised spatial data sets that can be used seamlessly in cross-border applications. Also from the terminology, the INSPIRE glossary has been considered and applied.

The database architecture (T3.1) is built on a hybrid approach, combining the strengths of both relational and non-relational databases to create a flexible and powerful data management system. The primary components include:

1. **Core Database Infrastructure**
    - Implementation of MYSQL for structured data management, chosen for its robust handling of complex queries and excellent support for spatial data
    - Development of a microservices architecture to ensure system modularity and scalability
    - Implementation of connection pooling and query optimization strategies
    - Creation of automated backup systems with point-in-time recovery capabilities

2. **INSPIRE Directive Implementation**
    - Comprehensive implementation of INSPIRE metadata standards, ensuring full compliance with EU spatial data infrastructure requirements
    - Development of standardized coordinate reference systems aligned with INSPIRE specifications
    - Creation of network services following INSPIRE technical guidelines
    - Implementation of data transformation services to ensure interoperability
    - Development of discovery services for metadata management
    - Integration of view services for spatial data visualization

3. **Data Structure Organization**: the database is organized into several logical layers:
    a. **Core Data Layer:**
        - User profiles and authentication information
        - Sensor data repositories
        - Spatial reference data
        - Activity logs and system metrics
        - Configuration parameters

    b. **Analytics Layer:**
        - Preprocessed data sets
        - Machine learning model results
        - Statistical analysis outputs
        - Performance metrics
        - Trend analysis data

    c. **Presentation Layer:**
        - Visualization configurations
        - User interface settings
        - Report templates
        - Dashboard configurations

2.3 Making data interoperable

Standardized formats and vocabularies for data and metadata will be employed to guarantee the interoperability of research outputs and data. Using open standards will facilitate interoperability and data integration, enabling researchers to compare and analyze data across different studies and disciplines.

2.4 Increase data re-use

The reuse of data and research outputs will be facilitated making available tools, software, and models for data generation, validation, interpretation. The licenses used for data sharing and reuse will also be tailored to encourage the reuse and citation of the data. Data sharing and reuse will be facilitated through licenses, such as Creative Commons or Open Data Commons.

The data produced in the project will be publicly available and will be prepared in such a way to be readable by third parties who would wish to use the collected data in their research work. The data will include structured databases, supplemented with documentation, including research tools, and a description of the methodology used.

3. Data management responsibilities and resources

The META-MUSEUM project places significant emphasis on data management, recognizing that efficient handling of research data is critical for achieving meaningful and reproducible results. Data management responsibilities are distributed among project partners, with BEIA leading the design, implementation, and maintenance of a secure and scalable data storage system. This system is designed to collect, store, and process diverse datasets, including sensor-generated data, questionnaire responses, and user-generated content. Before being stored, all data undergoes validation and preprocessing to ensure consistency, accuracy, and compliance with ethical and legal standards. BEIA is responsible for data curation, storage, and preservation and they will conduct data management and quality assurance. The technical partner will ensure the data’s security, privacy, and integrity and will be responsible for backup and recovery procedures. The costs associated with data management, curation, storage, and preservation is included in the project budget and will be reviewed regularly to ensure their sustainability.

Data management responsibilities and activities are shared among project partners following the META-MUSEUM project governance structure: a **comprehensive and structured management framework**, ensuring seamless coordination, effective decision-making, and adherence to ethical and legal standards. Central to this framework is the **Coordination Unit**, which plays a pivotal role in overseeing all project activities. Within this unit, the **Project Coordinator (PC)** holds primary responsibility for ensuring the project's successful implementation, guiding strategic execution, and maintaining alignment with the project's objectives. The **Vice Coordinator** provides continuous support in daily operations, ensuring the smooth functioning of activities across different work packages. Additionally, the **Project Manager (PM)** oversees all financial and legal matters, ensuring compliance with funding requirements, budget allocations, and regulatory frameworks.

A crucial aspect of project governance is the **Ethics Management Team (EMT)**, a dedicated group of three experts tasked with developing the **Ethics Management Plan** and ensuring that all activities—including data collection, processing, and analysis—adhere to the highest ethical standards. The EMT plays a key role in safeguarding **human rights, research ethics, and data privacy**, particularly in activities involving vulnerable groups, such as hospital patients. Ethical compliance is maintained in accordance with the **Declaration of Helsinki** and relevant EU regulations, ensuring that participants' rights and welfare remain a top priority. The EMT also provides ongoing oversight of ethical risks, offering guidance on mitigating potential ethical dilemmas and implementing best practices for responsible research.

Given the scale and complexity of the META-MUSEUM project, decision-making processes are structured to promote **transparency, inclusivity, and accountability**. The **General Assembly (GA)** serves as the highest decision-making body, where each project partner is represented to ensure **fair governance** and **collective decision-making**. The GA plays a key role in shaping the strategic direction of the project, addressing challenges, and defining policies that will sustain the project's impact beyond its official duration. Through regular meetings, the GA ensures that all partners are aligned with the project's objectives and that resources are effectively allocated to support research, technological innovation, and data management.

Technical coordination is facilitated by the **Work Package Leaders Board (WPLB)**, a dedicated team responsible for overseeing the implementation of various work packages. The WPLB ensures that the technical aspects of the project progress efficiently, maintaining synergy across research efforts, technological developments, and data management activities. This board acts as a central reference point for technical coordination, problem-solving, and knowledge-sharing among work package leaders. Meanwhile, the **General Assembly (GA)** remains the primary authority for addressing **non-technical** matters, including administrative, legal, and financial issues.

BEIA holds a **leading role in designing, implementing, and maintaining the data infrastructure**, ensuring **security, integrity, and compliance with legal and ethical frameworks**.

4. Data security

Secure storage of personal data is described in deliverable *D1.1 – Management Plan*. META-MUSEUM is committed to open science, while also respecting ethical considerations related to data sensitivity and privacy. For this purpose, if possible, data will be made openly available through trusted repositories, accompanied by documentation and metadata to support reusability. In cases where data includes personal or sensitive information, access will be restricted, or anonymization will be applied. To maintain the security and confidentiality of collected data, the storage system incorporates advanced encryption protocols, multi-layer authentication mechanisms, and GDPR-compliant access controls. These measures safeguard information against unauthorized access and ensure that sensitive data is handled responsibly. Furthermore, periodic backups and rapid recovery protocols are in place to prevent data loss and ensure continuity in the event of technical failures or unforeseen disruptions.

Beyond secure storage, META-MUSEUM is committed to ensuring long-term preservation and reusability of data, facilitating its use for future research and collaboration with the wider scientific and cultural heritage communities. A comprehensive data governance framework defines clear policies for data access, sharing, and protection, ensuring that all stakeholders operate within a transparent and legally compliant framework.

BEIA implements a comprehensive cybersecurity system to protect data from unauthorized access, tampering, and accidental loss.

1. **Security Architecture and Data Protection**
    - Enterprise-grade encryption
    - Authentication and access control
    - Threat monitoring and detection: BEIA integrates a Security Information and Event Management (SIEM) system for real-time anomaly detection.
2. **Backup and Disaster Recovery**
    - Automated daily backups and incremental backups every six hours, stored in ISO 27001-compliant data centers.
    - Fast data recovery mechanisms, ensuring restoration within a maximum of four hours in case of critical incidents.
    - GDPR and ISO 27701-compliant data retention policies, supporting anonymization and pseudonymization of sensitive data.
3. **Restricted Access to Sensitive Data**
    - Neurophysiological data (EEG, GSR, HRV, etc.) will be stored on dedicated servers with strict access control.
    - Participant identification will rely solely on randomized alphanumeric codes, eliminating the possibility of direct re-identification.
    - A Data Access Committee (DAC) will evaluate and approve access requests for sensitive datasets.

5. Legal and ethical requirements, codes of conduct

Approval from an ethics board is necessary for any research involving human participants to ensure that the dignity, rights, safety, and wellbeing of all individuals are the primary concern of the research study. According to the META-MUSEUM ethical approval procedure, protocols and necessary documents (including informed consent) will be sent to the local independent Ethical Committee for approval. An information sheet will be provided to all participants, who are required to sign the informed consent form to participate in the study. META-MUSEUM involves personal research data collection and processing from observational studies, experimental interventional studies, consultations and stakeholder meetings. Interventional studies will involve observational research methods: qualitative interviews/guided discussions with experts (i.e. Associated Partners museums' personnel), other events engaging stakeholders, and literature reviews. Ethics approval is not required for observational studies but is required for interventional studies. Each individual Member State may have different procedures and requirements. Several EU Member States have no requirement to obtain ethics approval for stakeholder consultations and studies where no human data will be included and/or processed, though differences are possible in relation to ethics oversight requirements and regulations. It’s important to refer to associated museums countries. The responsible partner’s/partners’ national ethics oversight regulations (i.e., in force in the country of the data controller) will be followed in all instances.

For WP2 (T2.1): A preliminary study led by KMOP has been conducted to define and analyse confidence, resilience and perception of the transformative nature of CH in different audiences. According to the applicable laws, regulations, and institutional procedures in the Greek context, Greece has a decentralized system regarding ethics approval. For T2.1 research activities (individual interviews with experts and online questionnaire for the general public) coordinated by KMOP, KMOP’s Ethical Research Committee oversees the process, reviews and approves the needed documents (e.g., data collection instruments, consent forms) and ensures the privacy and the safety of the participants. KMOP's Ethics Committee approved the T2.1 research activities and the data are stored by KMOP on password-protected computers using pseudorandomized codes. KMOP’s Research Ethics Committee requires that activities and data processing should be implemented in accordance with the provisions of the General Data Protection Regulation (Regulation (EU) 2016/679), the Universal Declaration of Human Rights and Convention 108 for the Protection of Individuals with Regard to Automatic Processing of Personal Data, the Declaration of Helsinki ethical principles for medical research involving human subjects, and the national laws, including those governing the acquisition of valid consent. All reasonable measures should be taken so that individual rights and freedoms of participants, especially those belonging in vulnerable populations, are protected. In the case of OPI PIB, which supported the execution of the research designed in WP2, all participants signed a consent to participate in the study and the data collected is stored according to GDPR guidelines, on password-protected computers, with no sensitive data stored.

WP5 (Laboratory based investigations), WP6 (P1: experimentations in Museums), WP7 (P2: experimentations in Hospitals) and WP8 (P3: experimentations in hybrid environments) will facilitate interventional studies where human participation is required. In these WPs, lead partners will be in charge of securing any required approvals from the research Ethical

Committee. In this regard, POLITO has achieved the approval from its Ethical Committee to implement the activities within WP6 (*status quo* and P1 measurement implementation). Where ethics approval or notification is required for a study, the study will only start after obtaining the required approvals from the responsible partner's country (i.e., the country of the partner deemed the data controller). The design of protocols related to ethical issues related to national, EU, and international guidelines will be performed. For WP5, the applications for ethical approval, including the Information Sheet, Informed Consent, and Privacy Statement (T5.2), are in the process of being finalized and will be submitted to the local Ethical Committee for approval. All participants will be required to sign the informed consent before taking part in the laboratory-based investigations. For the WP7, documents, including the Clinical Risk Management Plan (T7.2), will be developed and submitted the local Ethical Committee for approval, and all patients will be required to sign the informed consent to participate in the study in Hospitals. UNIROMA1 will be responsible for obtaining ethical committee approval for the collection of clinical data for the WP7 (in hospitals). The data will be stored by UNIROMA1 on password-protected computers using pseudorandomized codes. The protocols according to the Declaration of Helsinki about experiments involving humans, and the informed consent specific for volunteering participants will be sent to the Ethical Committees for approval and all participants will be required to sign the informed consent to participate in the study. The appropriateness and completeness of the written information to be communicated to the subject and procedures concerning the collection of informed consent will be taken into account. Data and any ethics related issues will be managed according to DMP and the EMP.

6. Data management plan: Compliance, Assessment, Ongoing Management and updates

Compliance with the Data Management Plan will be assessed at regular intervals throughout the project lifecycle and beyond. The key responsibilities are distributed as follows:

- Assessment Timeline: Compliance will be monitored at least annually and at major project milestones. A final assessment will be conducted before the project's conclusion.
- Responsible Parties: in collaboration with the Project Coordinator, all responsible partners will oversee compliance.
- Assessment Methods: Compliance will be ensured through internal audits, periodic data reviews, and alignment with Horizon Europe's open science policies. A data access log will be maintained to track data usage and modifications.
- Handover Procedures: If there is a transfer of responsibility for data management, a formal handover process will be documented, detailing the scope, access rights, and preservation requirements.
- Long-Term Decision-Making: After the project concludes, the lead beneficiary (or a designated institution) will take charge of long-term data governance. Clear protocols

for decision-making regarding data access, updates, and modifications will be established.

- Financial Sustainability: Costs for long-term data storage and management will be covered through institutional funding, national research infrastructures, or dedicated repositories (e.g., Zenodo, institutional archives).