State-of-the-Art Review

Digitisation of Cultural Heritage:
Methodologies, Technologies and Best Practices

HERITALISE

Heritage Malta

unesco Chair

Cyprus University of Technology

State-of-the-Art Review

Digitisation of Cultural Heritage: Methodologies, Technologies and Best Practices

Result Report

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1 Preface

This document presents the results of the current review of the State-of-the-Art on Methodologies, Technologies and Best Practices in the Field of Digitisation of Cultural Heritage. This work was based on the combined efforts of Heritage Malta, the UNESCO Chair on Digital Cultural Heritage at the Cyprus University of Technology, and collaborators under the HERITALISE Horizon Europe Project (Project No.101158081).

Contributors:

HM	Heritage Malta, Technology and Experience Development Unit
CUT	Cyprus University of Technology, UNESCO Chair & Research Center MNEMOSYNE
IIIF	International Image Interoperability Framework
E-ARK	eArchiving Initiative

1.1 Project Tasks

This survey forms a core component of Work Package 3: Review of the State of the Art and Definition of Methodologies, Risks and Protocols within the HERITALISE project. Specifically, it contributes to Subtask 3.1, by providing an empirical overview of current practices, capacities, and challenges in the digitisation of both tangible and intangible cultural heritage. The findings also inform Subtask 3.2, supporting the evaluation of existing methodologies for data acquisition through comparative insights into technological adoption, interoperability standards, and institutional workflows. Finally, the results presented here underpin Subtask 3.3, offering an evidence base for identifying risk factors and shaping mitigation strategies and protocols for virtual heritage object management. As such, this document not only summarises sectoral realities but also serves as a foundational analytical tool guiding the development of methodological frameworks within HERITALISE.

2 Executive Summary

This report presents the key findings of an international survey designed by the HE HERITALISE Project partners HM and CUT supported by IIIF and the EU eArchiving Initiative, to map current digitisation practices, challenges, and future aspirations within the global cultural heritage sector. With more than 1,200 accesses and 423 complete responses, across six continents, the survey reflects insights from a diverse and experienced community of museums, heritage agencies, archives, universities, and independent professionals actively engaged in digital documentation.

The results reveal a sector driven by strong commitment and innovation but constrained by fragmentation and uneven infrastructure. While most institutions digitise artefacts, photographs, and architectural elements, an increasing number are expanding into intangible heritage and contextual materials, signalling a shift toward more holistic cultural representation. Photogrammetry and 3D scanning remain the most widely used acquisition methods, yet their integration into interoperable systems for management, access, and reuse is inconsistent. Data storage practices further highlight this imbalance: although hybrid local–cloud approaches are common, many institutions still rely heavily on local servers, posing long-term sustainability risks.

Gaps in metadata and paradata practices limit transparency and future interpretability of digital assets. While acquisition settings are often recorded, workflow documentation and decision-making processes are far less consistently captured. AI tools are used selectively, primarily for post-processing, reflecting both experimentation and a lack of coherent guidance. Familiarity with conceptual frameworks also varies: a third of respondents recognise Digital Twins, however, the emerging awareness of the Memory Twin model demonstrates the sector's readiness for a conceptual shift: from digitisation as replication toward digitisation as memory stewardship.

A notable finding is the disconnect between practitioners and major European initiatives such as eArchiving, the Common European Data Space for Cultural Heritage, and Europeana, with low levels of participation driven by technical, procedural, and legal barriers.

Respondents identified clear needs: increased funding, stronger training and capacity building, shared standards, and greater international collaboration. The strong interest in joining global networks reflects a sector ready for coordinated action. The survey underscores a collective vision for an inclusive, sustainable, and interoperable digital heritage ecosystem, of which requires the structures and standards capable of supporting it.

3 Introduction

The survey aims to present a real-world, cross-sectoral snapshot of digitisation practices, techniques, tools, and standards in cultural heritage, documenting how these are being implemented across diverse institutional, disciplinary, and geographic contexts worldwide.

In recent years, the field of cultural heritage digitisation has grown rapidly, shaped by global technological advancements, increased demands for access and preservation, and shifting institutional priorities. However, practices remain highly diverse and often fragmented, varying according to available resources, disciplinary traditions, and local frameworks. This survey was therefore designed to capture diversity in order to understand how professionals and organisations worldwide are approaching digitisation, what technologies and standards they are using, and which challenges or limitations they face.

Rather than prescribing a single direction, the survey sought to explore how digitisation is interpreted and practised across different types of heritage, including but not limited to 2D and 3D documentation to audio-visual, textual, archaeological, architectural and intangible assets. It aimed to identify both shared challenges and emerging innovations, highlighting how priorities and capacities differ among key stakeholders, including public and private institutions, museums, libraries, archives, conservation and restoration centres, research organisations, and religious custodians of heritage. The study also aimed to engage a wide range of roles within the sector, from technologists and data specialists to managers, curators, and policymakers, to reflect the interconnected nature of digital heritage work.

By analysing these responses, the survey sought to define the state-of-the-art in the digitisation of cultural heritage, to benchmark emerging practices and identify practical, ethical, and technical gaps that shape the field's future development. It aimed to understand where cultural institutions currently stand, how they differ across regions and organisational types and roles, and what priorities are driving their digitisation decisions.

The survey was conducted within the framework of the EU Horizon Europe HERITALISE project, which focuses on developing strategic approaches to cultural heritage digitisation across Europe and beyond. It was also aligned with the Memory Twin Alliance, an emerging partnership exploring advanced methods of digital representation and preservation.

Through its global reach and cross-sectoral engagement, the survey offers valuable insights into the evolving landscape of cultural heritage digitisation and supports the development of strategic, collaborative, and future-oriented frameworks for the field.

4 Methodology

4.1 Strategic Approach

The survey was designed as part of a strategic effort to capture a comprehensive, cross-sectoral snapshot of digitisation practices in cultural heritage. The aim was to obtain a nuanced understanding of how different types of institutions, professional roles, and geographic regions approach the digitisation of tangible and intangible heritage. This strategic framing guided the selection of survey themes, question types, and the overall structure, ensuring that the survey would collect data not only on technical tools and standards but also on institutional priorities, challenges, and emerging practices.

Targeting was a critical component of this approach. The survey was deliberately directed at a broad spectrum of stakeholders, including technologists, curators, conservators, archivists, managers, policy makers, and independent researchers. Institutions ranged from museums, libraries, and archives to research centres, conservation/restoration institutes, religious organisations, and both governmental and non-governmental bodies. By encompassing both public and private entities, the survey sought to reflect the diversity of organisational scales, governance structures, and responsibilities across the heritage sector.

The strategic approach also informed the survey's thematic clusters and question design. Questions were formulated to capture multiple dimensions of digitisation work, including asset types, technologies, standards, documentation practices, engagement with EU and international frameworks, and support needs. Multi-answer and open-text formats were included to allow participants to reflect the complexity of their work, while skipping logic and optional questions ensured accessibility across varying levels of experience and expertise.

Finally, distribution channels and outreach strategies were selected to maximise participation and ensure global representation. The multi-channel strategy, combined with targeted engagement of key professional networks, enabled the survey to reach cultural heritage practitioners, researchers, and decision-makers worldwide, capturing a truly international perspective on digitisation practices.

4.2 Survey Design

The survey consisted of 48 questions, designed to provide a multidimensional view of digitisation practices in the cultural heritage sector. Questions combined multiple-choice formats with optional open-text input fields for elaboration, and many offered multiple-answer options to reflect the diversity of roles, institutional approaches, and tools. Several items included prioritisation scales to assess perceived importance of objectives or challenges.

All questions were optional, with skip logic applied where relevant, allowing the survey to adapt to respondents' experience and knowledge level. This structure ensured inclusivity, ensuring

accessibility across a wide range of knowledge levels and professional backgrounds, while also improving data quality by providing the potential to filter out sections.

Questions were organised into five thematic clusters:

1. **Institutional Profile and Roles** *(Q1–Q9)*
   Captured data on the nature of the organisation, legal status, scale, geographic location, ownership of CH assets, respondent roles, and level of digitisation experience.
2. **Digitisation Practice and Technical Capacity** *(Q10–Q20)*
   Focused on the types of heritage being digitised, tools and technologies used, storage and management of digital assets, reuse and accessibility strategies, and documentation methods.
3. **Advanced Concepts and Standards** *(Q21–Q36)*
   Explored the adoption of complex modelling systems such as BIM, HBIM, HHBIM, and concepts like Digital Twins and Memory Twins. It also included questions on AI, metadata and paradata use, ontologies, standards, and digitisation strategies.
4. **Engagement with European Frameworks** *(Q37–Q44)*
   Investigated familiarity and involvement with EU-level initiatives; Europeana, the EU eArchiving initiative, and the Common European Data Space for Cultural Heritage.
5. **Support Needs and Community Perspectives** *(Q45–Q48)*
   Gathered insights on support structures needed by practitioners, interest in international networks, willingness to receive survey results, and space for open-ended feedback.

4.3 Duration

The survey was open for a total of 76 days, from 10 April 2025 to 23 June 2025. This period was deliberately chosen to ensure maximum participation across different geographic regions and professional calendars. Opening the survey in April allowed for engagement after the start-of-year planning cycles in most institutions; while keeping it open through late June ensured that respondents from both the northern and southern hemispheres had sufficient time to participate before summer breaks or fiscal year-end activities.

The average estimated time to complete the survey was 15 minutes, providing a reasonable commitment while still capturing in-depth insights.

4.4 Target Audience

Participants were selected using a targeted, purposive sampling approach, designed to capture the diversity of professional roles, institutional types, and geographic contexts relevant to cultural heritage digitisation. This approach prioritised representation from a broad spectrum of stakeholders, ensuring that the survey results reflected multiple perspectives on both technical and strategic aspects of digitisation.

The survey sought participation from individuals affiliated with:

- Museums
- Archives
- Libraries
- Research institutions
- Conservation and restoration organisations
- Government and policy organisations
- Non-governmental organisations (NGOs)
- Independent researchers and consultants
- Religious institutions
- Other organisations involved in heritage management or digitisation

Within these organisations, respondents were selected to represent different roles and responsibilities, including: CEOs, directors, and managers; curators, archivists, and librarians; conservators and restorers; researchers; IT or digital specialists; policy makers and administrators; academics; and any other professionals engaged in or impacted by digitisation practices.

Sampling also considered the diversity of institutional scale and governance structures. The survey included small, medium, and large organisations, as well as state-owned, private, and public institutions. Ownership of cultural heritage assets was another key criterion, ensuring input from those managing, owning, or collaborating on the stewardship of heritage assets, as well as other independent stakeholders engaged in or impacted by digitisation practices.

A deliberate effort was made to include participants from diverse geographic regions. This global coverage was critical to understanding the state-of-the-art in digitisation practices across different regulatory, cultural, and infrastructural contexts. Regional differences can influence technological adoption, resource availability, and institutional priorities, making broad geographic representation essential for a comprehensive survey of cultural heritage digitisation.

The survey's purposive approach ensures that multiple perspectives are captured, from decision-makers shaping digitisation policy to practitioners executing technical workflows. By sampling across organisational types, roles, ownership structures, and geographies, the survey provides a holistic view of current practices, challenges, and emerging trends. This diversity in sampling is particularly important for understanding how digital cultural heritage initiatives are implemented in real-world contexts, where institutional capacity, expertise, and local conditions vary widely.

4.5 Distribution

The survey was distributed using a strategically coordinated and multilayered approach, designed to ensure maximum coverage across the global cultural heritage sector. The strategy was grounded in the principle that research benefits the collective, aiming to capture perspectives from a wide spectrum of institutions, roles, and geographies.

Contact lists were compiled through the HERITALISE consortium and partner institutions, ensuring representation from diverse institutional types. This method allowed precise targeting of relevant stakeholders, guaranteeing that responses came from individuals with the expertise or authority to provide meaningful insights, and was primarily implemented through direct email outreach.

Online dissemination materials including digital banners, graphics, social media posts, and newsletters enhanced visibility across professional, academic, and social networks. Strategically designed visuals drew attention, increased engagement, and reinforced the survey's credibility and professionalism. Hosting the survey on project-specific webpages ensured open-access participation for any stakeholder visiting the HERITALISE project portals, reinforcing transparency, and the research-oriented ethos of the survey. Newsletters enabled outreach to broader professional communities beyond direct contacts, particularly engaging mid-level practitioners, researchers, and institutional staff whose operational perspectives are critical for understanding practical digitisation practices. LinkedIn was used to reach sector-specific groups and discussion forums, allowing the survey to penetrate informal networks and capture perspectives beyond formal institutional channels.

Physical and visual dissemination materials, such as posters and QR codes, complemented digital outreach and ensured visibility among stakeholders who may not be regularly online or connected via email/newsletters. At conferences and professional events, the survey was presented through posters, QR codes, and verbal mentions, enabling direct engagement with key stakeholders, immediate access to the survey, and reinforcing legitimacy and purpose. These activities engaged existing professional networks, creating a ripple effect beyond immediate attendees.

Leveraging existing connections through institutional networks, expert groups, and collaborative partners ensured inclusion of stakeholders in regions or sectors where direct contact lists were incomplete. Each channel addressed a potential gap in reach or representation: direct outreach targeted known stakeholders; newsletters and webpages widened visibility; social media engaged informal networks; and expert networks ensured inclusion of niche or underrepresented voices. Together, this multilayered distribution maximised the likelihood of capturing the full diversity of institutional types, professional roles, and geographic regions, aligning with the survey's objective of providing a comprehensive, global overview of digitisation practices in cultural heritage.

4.6 Reach

The survey achieved extensive global reach, accessed by over 1200 people, with 423 responses recorded from six continents, covering 97 countries and 67 UN member states. This geographic distribution demonstrates the international relevance of the study and reflects the strong engagement of professionals across diverse cultural, institutional, and socio-political contexts.

While Europe accounted for the largest share of respondents, substantial participation from Asia, North and South America, Africa, and Oceania underscores the global resonance of the survey's themes and the growing interconnectedness of the digital heritage community.

A total of 423 valid responses were received from professionals directly or indirectly involved in the digitisation of cultural heritage. Respondents represented a diverse spectrum of organisations. A diversity indicative of the survey's success in capturing perspectives across the full ecosystem of cultural heritage digitisation, from high-level policy frameworks to practical, hands-on implementation.

The survey achieved a 51% completion rate, which is considered robust for a voluntary, international study of this scope. On average, respondents spent 13 minutes and 17 seconds completing the survey, indicating thoughtful engagement with the questions. Given that the survey contained nearly 50 questions, many of which required detailed professional reflection and institutional input, this completion rate demonstrates a high level of engagement and commitment among participants. Comparable global surveys in the cultural and digital heritage sectors often yield lower completion rates, particularly when distributed openly across multilingual and multi-sector audiences.

The fact that over half of respondents completed the full survey suggests that participants were highly motivated and viewed the topic as directly relevant to their professional realities. Moreover, as the survey offered no financial or institutional incentives, this level of participation reflects genuine interest and willingness within the global cultural heritage community to contribute to a shared understanding of current digitisation practices, challenges, and future directions.

This level of global engagement reinforces the methodological strength of the study and enhances the credibility of its findings. The reach achieved through multilayered distribution not only ensured geographic diversity but also facilitated cross-sectoral representation, aligning with the overarching aim of the survey: to provide a comprehensive and inclusive overview of the state of digitisation in cultural heritage worldwide.

5 Data Overview

5.1 Respondent Profile

Before delving into the detailed data, it is important to outline how the information collected through the survey is organised in this chapter. The dataset is available in both raw and filtered formats, allowing flexible exploration by question, respondent category, or any combination of professional or institutional variables. It also distinguishes between EU and non-EU participants, offering an additional layer of comparative insight.

For the purpose of this chapter, the results are presented in aggregate form, representing the responses of all participants as a whole. This provides a cohesive overview of the global landscape before narrowing the focus to regional and contextual differences.

To gain sector-specific insights, the survey disaggregated responses according to the professional, institutional, and geographic affiliations of participants. This approach enables the identification of patterns, practices, and gaps that are specific to different domains of cultural heritage digitisation, and helps contextualise the expectations, capabilities, and responsibilities observed across various stakeholder groups. The survey attracted a broad and international audience, reflecting the diverse ecosystem of professionals engaged in the digitisation of cultural heritage. The questions in this section were designed to capture institutional characteristics, respondent roles, legal status, staffing structures, and levels of digitisation experience (Fig. 1).

Fig. 1. Diagram of categories used throughout the survey and this report to help identify different institutional contexts, digitisation practices and strategic approaches.

With the above framework in mind, the following section presents the respondent profile, illustrating who participated in the survey and how their institutional and professional contexts influence digitisation practices and strategic approaches. The categories defined in Figure 1 are applied consistently throughout this report to ensure comparability and coherence across all sections.

Respondents were asked to identify the type of organisation they represent. The responses reflect a high level of engagement from members of research and academic institutions, followed by museums and independent researchers. The institutional affiliation data reveals a strong representation from research institutions (47.04%), indicating a high level of academic and methodological engagement with the topic of digitisation. This is followed by museums (21.51%), which reflects the sector's increasing investment in digitisation for access, preservation, and engagement. Other notable groups include independent researchers/consultants (12.77%), government or policy organisations (11.35%), and archives (11.11%), underscoring the interdisciplinary nature of the field. The presence of NGOs, conservation/restoration institutes, and libraries, though smaller in proportion, highlights feedback from broader institutional ecosystem involved in heritage digitisation. While religious institutions accounted for a minimal percentage (0.47%), their inclusion points to the diverse custodianship of cultural heritage assets across organisational types. (Fig.2).

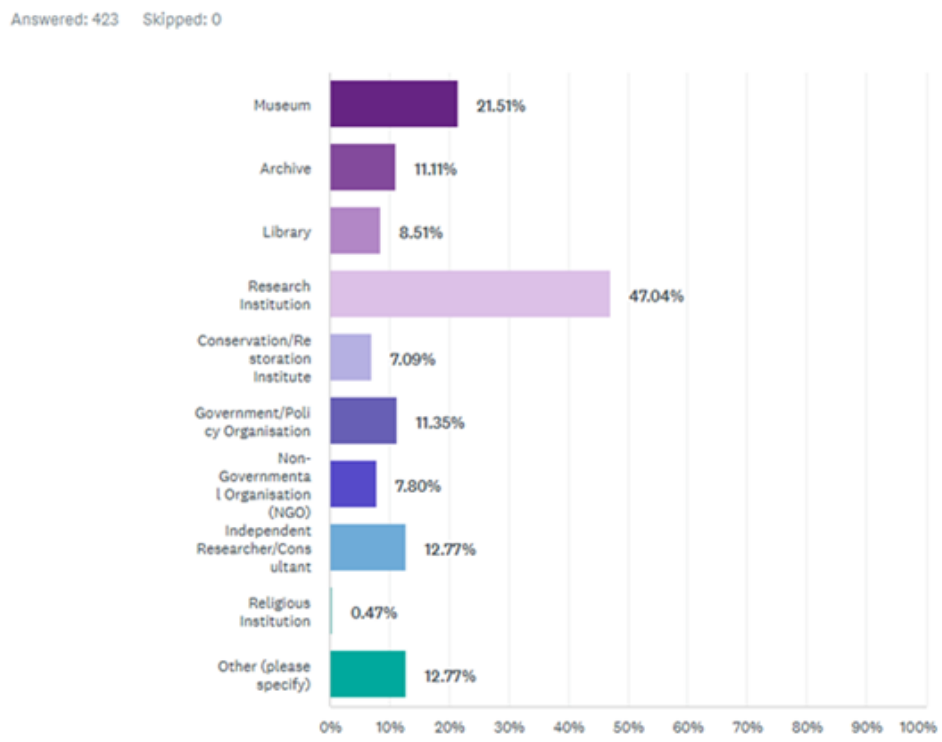

Fig. 2 Participant Organisation Representation

More than half of the participants surveyed belong to state-owned institutions (52.75%), while private organisations accounted for just under a quarter (24.18%). NGOs and publicly listed organisations comprised 14.29% and 8.79% respectively. (Fig.3). When asked about institutional size, nearly half (47.99%) of respondents came from large organisations with over 100 staff members. Small organisations (1–10 staff) represented 25.77%, and medium-sized organisations (11–100 staff) made up 26.24%. (Fig. 4). While large institutions (over 100 staff) represented nearly half of respondents, their size does not always correlate directly with high levels of digitisation experience. Although 43.26% of organisations described themselves as highly experienced, the remaining majority fell within moderate to beginner levels. (Fig. 5). Additionally, the relatively small size of most digitisation teams; 1 to 5 staff members in over half of the cases - reveals a lean operational model, even within large institutions. It further emphasises the need for scalable workflows and continued investment in skill-building.

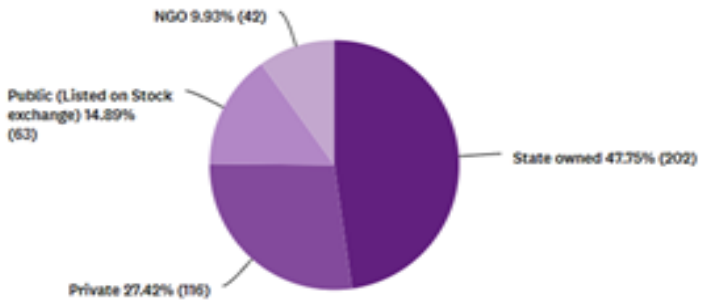

Fig.3 Legal Status of Organisations

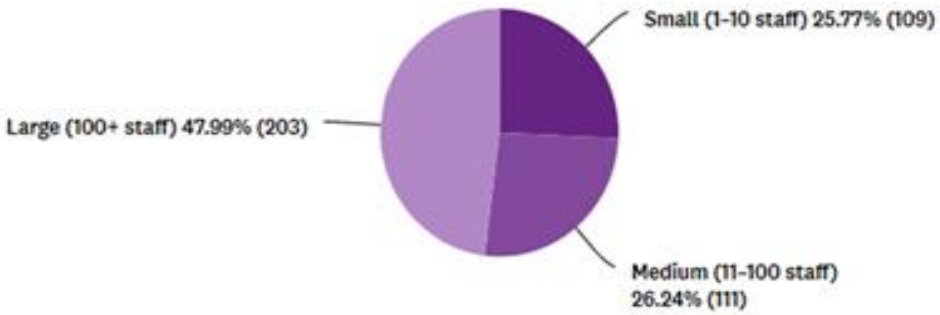

Fig.4 Size of Organisational

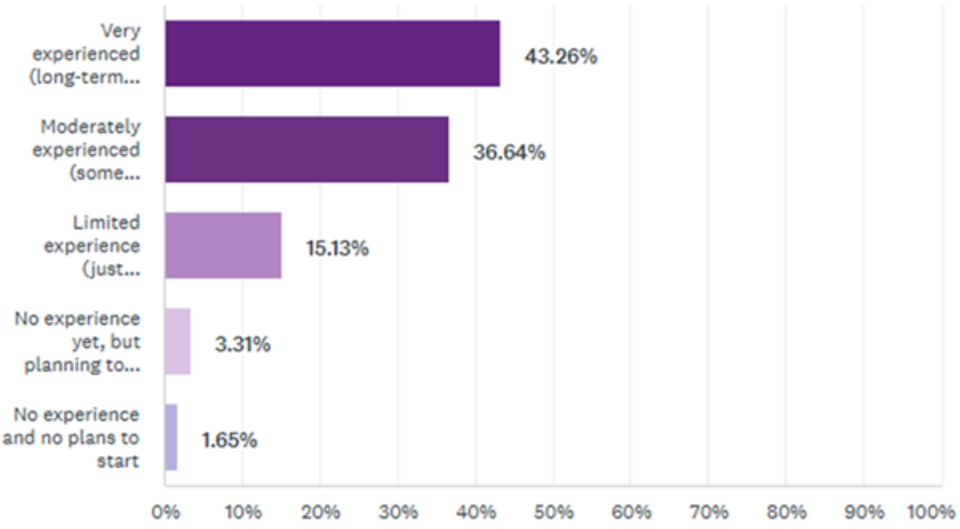

Fig.5 Digitisation Experience

In terms of asset ownership, responses were almost evenly split: 35.93% reported that their organisation owns the cultural heritage it digitises; 36.41% said they do not own the assets; 27.66% indicated a mixed model, digitising both owned and external material. This variation highlights the role of partnerships and collaborative efforts in digitisation projects, particularly for institutions that serve as service providers or researchers rather than custodians.

Respondents held diverse roles within their organisations, often identifying with more than one professional function. The distribution of roles reveals a strong presence of curators and archivists, alongside substantial representation from IT and digital specialists, researchers, and academics. This indicates that many participants are directly engaged in the practical and technical aspects of cultural heritage digitisation. At the same time, the presence of directors, managers, and those in leadership or governance roles suggests that strategic and institutional priorities were also well represented in the responses. The inclusion of curators, archivists, librarians, conservators, and policy professionals highlights the breadth of perspectives contributing to the survey, from operational execution to long-term planning and preservation. (Fig. 6).

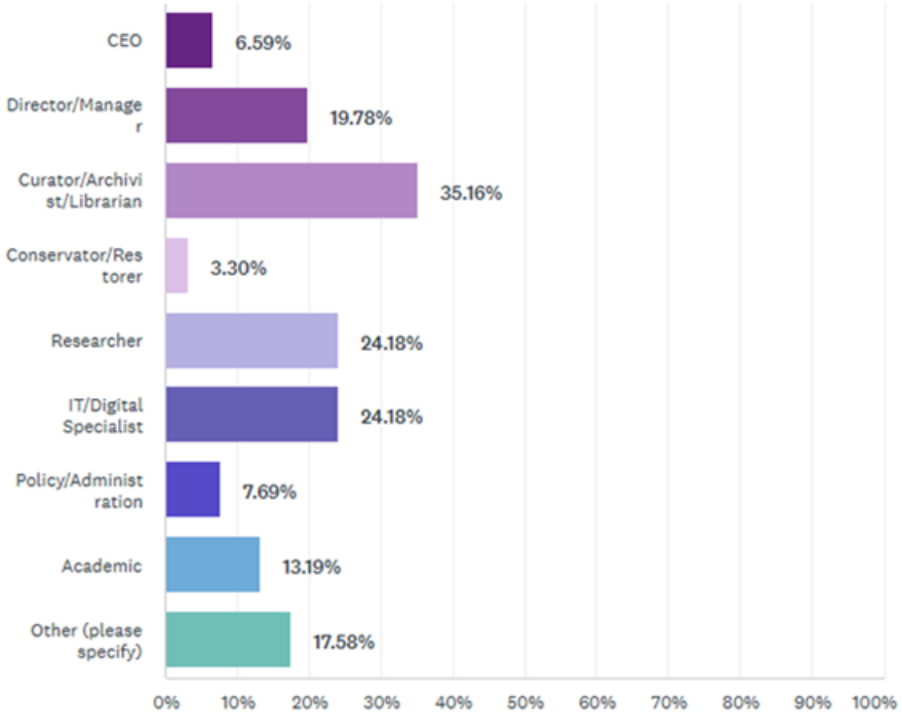

Fig.6 Establishing Organisational Role

Furthermore, while members of research institutions represent the largest group of survey respondents (47.04%), it is important to note that their role in digitisation does not necessarily equate to asset ownership. According to the data, only 35.93% of respondents reported that their organisations own the cultural heritage assets they digitise, while a similar proportion (36.41%) do not own the assets at all, and 27.66% reported a mix of both. This highlights a key dynamic in the field: many digitisation initiatives are carried out by institutions acting in collaborative, custodial, or research capacities, rather than by the primary owners of the heritage itself. For instance, museums, which typically hold their own collections, are the second-largest respondent group (21.51%), reinforcing the importance of distinguishing between custodianship and contribution to digitisation efforts. This diversity underscores the need for frameworks that support inter-institutional collaboration and clarify roles in terms of access rights, preservation responsibilities, and long-term data stewardship.

In terms of geographical distribution of the 423 participants, these came from 97 countries across six continents, with a particularly strong response from Europe. The data shows that while the majority of responses came from European countries, which is to be expected given the HERITALISE project's European base, the survey also successfully reached a substantial number of respondents across Asia, North and South America, Africa, and Oceania. (Fig. 7).

In total, 280 out of 423 participants (66.2%) were based in Europe. Of these, 234 respondents (55.3%) were affiliated with institutions within the European Union, while 46 participants (10.9%)

came from non-EU member-states. The remaining 143 participants (33.8%) represented regions outside Europe.

The top ten countries by response volume were Italy (8.98%), the United Kingdom (7.57%), Spain (6.62%), Malta (6.38%), Greece (5.67%), Germany (4.49%), France (4.02%), the United States (4.02%), Sweden (3.55%), and Belgium (2.60%), accounting for just over half of the survey participation (53.9%).

Fig.7 Geographical Reach: Participation across the globe

5.2 Digitisation Workflows, Technical Capacities and Challenges

Understanding how digitisation workflows are organised and executed across the cultural heritage sector is essential for identifying operational realities and institutional capacities. The survey therefore sought to determine who is involved in digitisation, how responsibilities are distributed, and what resources are allocated to digital acquisition processes. This section focuses on the structure of digitisation teams, their roles, and the staffing dynamics that underpin heritage digitisation activities worldwide.

5.2.1 Roles and Responsibilities in Digitisation Workflows

Respondents were first asked to indicate their specific involvement in digitisation workflows, with many reporting overlapping responsibilities within their organisations. Nearly half (48.23%) indicated that they manage digitisation projects, while 34.28% are directly engaged in hands-on data acquisition. Additionally, 29.31% reported overseeing projects at a strategic or administrative level, and 26.00% noted involvement in post-processing tasks. Just over one-fifth (21.75%) of respondents stated that they are not involved in any aspect of data acquisition, while a smaller number (4.02%) selected “Other,” referencing roles related to education, policy-making, or advisory functions. (Fig. 8).

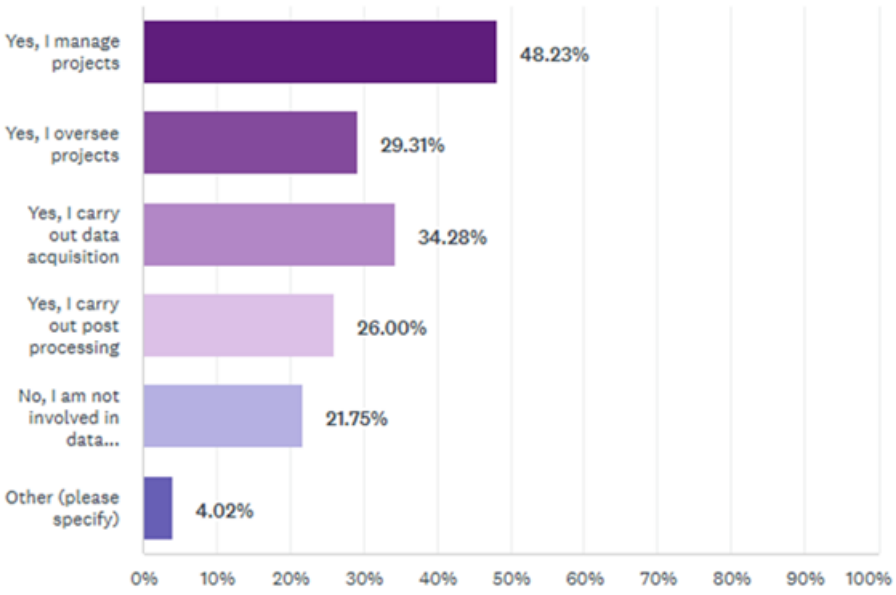

Fig.8 Data Acquisition Responsibilities

These findings reflect the reality that digitisation responsibilities are often integrated into broader institutional roles rather than existing as discrete technical functions. Digitisation tasks are frequently shared across departments or embedded within multidisciplinary project teams, illustrating the hybrid nature of professional responsibilities in the field.

Participants were also asked to report the size of the teams in their institutions directly involved in digital acquisition. The majority of respondents (53.43%) came from organisations with between one and five staff members dedicated to digitisation. A further 21.28% reported teams of between six and fifteen, while 13.48% indicated having more than fifteen personnel working on digital acquisition. Notably, 11.82% of participants stated that they had no dedicated digitisation staff at all, suggesting that digitisation in many cases remains a distributed or part-time responsibility within existing institutional frameworks. (Fig. 9).

These figures point to a persistent capacity gap across the sector. These results indicate that while some institutions benefit from specialised teams with clear roles, many operate with minimal dedicated staffing, or rely on shared responsibilities within broader organisational structures. The findings underscore the need for sustained investment in training, resourcing, and strategic planning to support scalable, long-term digitisation programmes. This could also be indicative of highlighting a workforce that is both adaptable and overstretched, with many professionals fulfilling multiple technical and managerial duties within lean institutional structures.

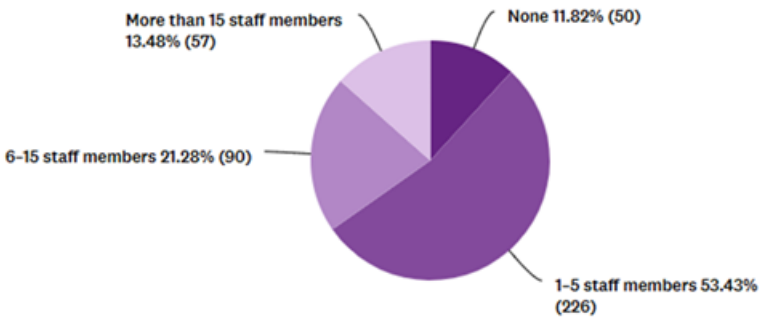

Fig.8 Staff Involvement in Digital Acquisition

5.2.2 Types of Cultural Heritage Assets Digitised

Before examining technical capacities, it was necessary to understand what kinds of cultural heritage assets are being digitised. Identifying asset types is key to understanding both the rationale for digitisation and the technological choices that follow, since selecting appropriate methods depends heavily on the nature of the object or site.

Archaeological artefacts (61.05%) and photographs and visual media (59.59%) were the most commonly digitised asset types, closely followed by architectural heritage (58.14%) and textual documents such as manuscripts, books, and archival records (56.98%). Artworks including paintings, sculptures, and other artistic media accounted for 46.22% of responses. A notable proportion of respondents also reported working with intangible cultural heritage (34.59%), such as oral histories and traditions, as well as audio-visual materials (32.85%). This demonstrates a growing awareness of the need to document non-material forms of heritage that are equally at risk of loss. Although smaller in percentage, the 9.88% who selected "Other" reflects the presence of other asset categories not covered by the predefined options predominantly including; textiles, underwater cultural heritage, aerial and satellite photos and historic vehicles. (Fig. 9).

The prevalence of archaeological, visual, and architectural assets underscores the continued dominance of material heritage within digital initiatives, though the growing inclusion of intangible forms signals an evolving understanding of cultural heritage in the digital era.

Fig.9 Types of Cultural Heritage Assets

5.2.3 Challenges in Data Acquisition

Having identified what types of heritage are being digitised, the survey next explored the primary obstacles encountered during data acquisition. This question received 344 responses, with 79 individuals skipping it, reflecting a natural drop-off in response rate for more technical or operational topics.

The results reveal several persistent structural and technical barriers. Lack of funding emerged as the most frequently cited challenge (71.22%), highlighting ongoing financial constraints across the sector. Limited equipment or resources was the second most reported challenge (50.58%), followed closely by storage infrastructure limitations (41.28%) and the lack of standardisation in acquisition and processing workflows (40.99%). Issues related to institutional support (34.30%) and limited metadata/paradata knowledge (33.14%) further illustrate the internal capacity struggles that many organisations face. Nearly one-third of respondents also identified a lack of technical expertise (31.69%), pointing to the continued need for training and skill development. Other challenges included legal and intellectual property restrictions (20.64%) and a lack of computing power for processing large datasets (25.00%). These constraints are especially relevant as institutions scale up digitisation or move toward more complex 3D or time-based digital heritage formats. (Fig. 10). These findings suggest that while technological tools are increasingly available, their effective application is still constrained by systemic and institutional factors particularly funding, standardisation, and skills development.

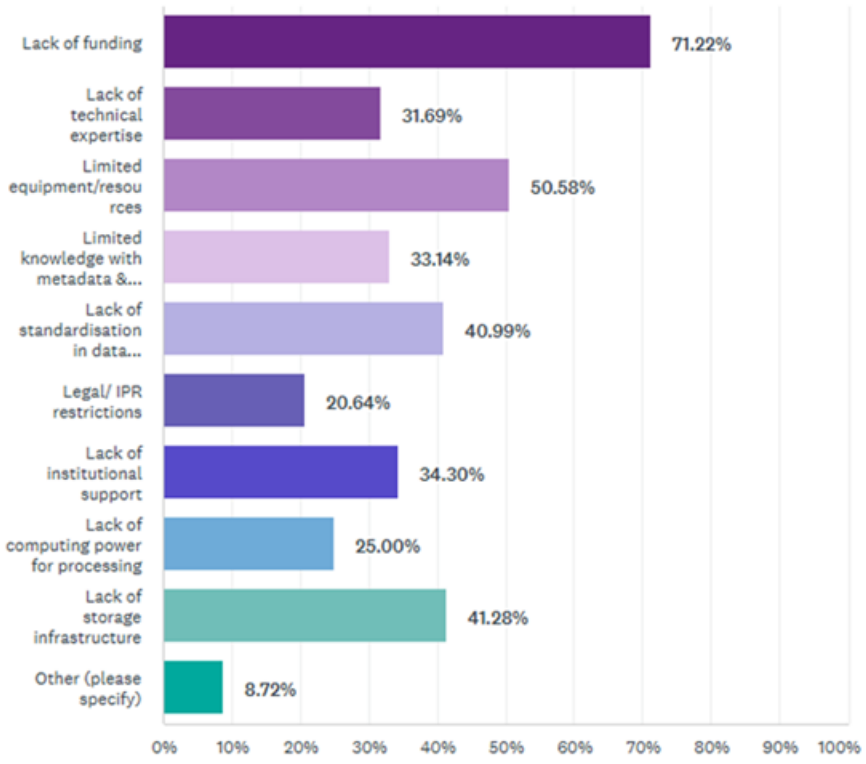

Fig.10 Types of Cultural Heritage Assets

5.2.4 Data Storage Practices

Before beginning any acquisition process, it is essential to determine how the resulting data will be stored and managed, as storage strategies directly affect acquisition planning and sustainability. Respondents were therefore asked where/how they store the digital assets they produce.

Respondents were asked where they store the digital assets they produce. The majority (72.67%) reported storing data on locally hosted infrastructure, indicating strong reliance on in-house servers or institutional systems. Cloud-based storage solutions, particularly dedicated or managed cloud servers, were also widely used (54.07%), while shared servers were reported by 33.43% of respondents. This distribution suggests a hybrid landscape, where both local and remote infrastructures are used, likely depending on institutional size, capacity, and access to IT support. A smaller group (8.43%) offered alternative arrangements under the “Other” category, including; external partnerships servers, leased data centres, national level digital preservation services, central state infrastructures and public funded institutional repositories. (Fig. 12).The results suggest that hybrid storage environments, balancing local and cloud infrastructures are now the norm across the sector. However, continued reliance on local servers also raises concerns about long-term sustainability, security, and interoperability.

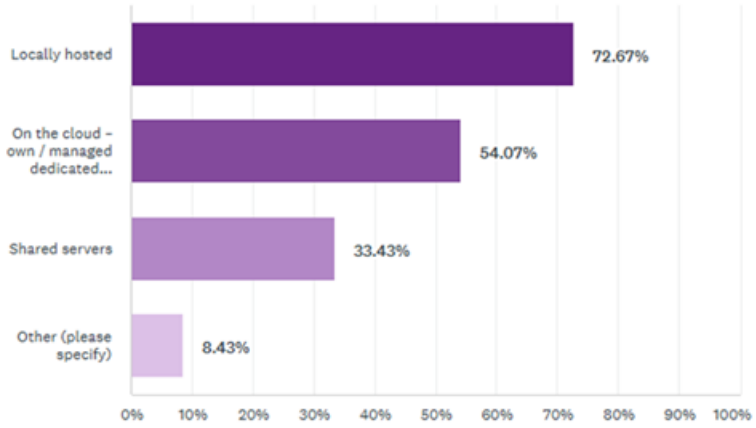

Fig.12 Organisation of asset in storage

5.2.5 Data Acquisition, Analytical and Diagnostic Integration

Having mapped institutional responsibilities and storage practices, respondents were then asked to indicate the technologies employed in their data acquisition workflows. The results illustrate a sector increasingly reliant on 3D scanning (63.66%) and photogrammetry (63.08%), followed closely by 2D scanning (53.78%). These dominant methods indicate the ubiquity of visual and spatial documentation across cultural heritage types. Drone-based imaging (42.73%) and 360° photography or video (42.44%) point to expanded uses of immersive capture, while LiDAR (32.56%) and Structured Light Scanning (26.16%) reflect more precise geometric mapping practices. Additional tools such as Time-of-Flight (ToF) scanning (11.34%), RTI (13.37%), and audiovisual recording (34.01%). More specialised techniques, including multispectral (18.31%) and hyperspectral imaging (8.43%), along with Computed Tomography (7.85%), MRI (2.03%), and Thermography (8.14%) further demonstrate the diversity of tools being employed. Just 3.20% indicated that none of the listed technologies were in use in their organisation. The “Other” responses (10.17%) ranged from general photography, geospatial prospecting, GNSS systems (topographic acquisition: Total Stations), ground penetrating RADAR (GPR) and audio recording equipment (Fig. 13).

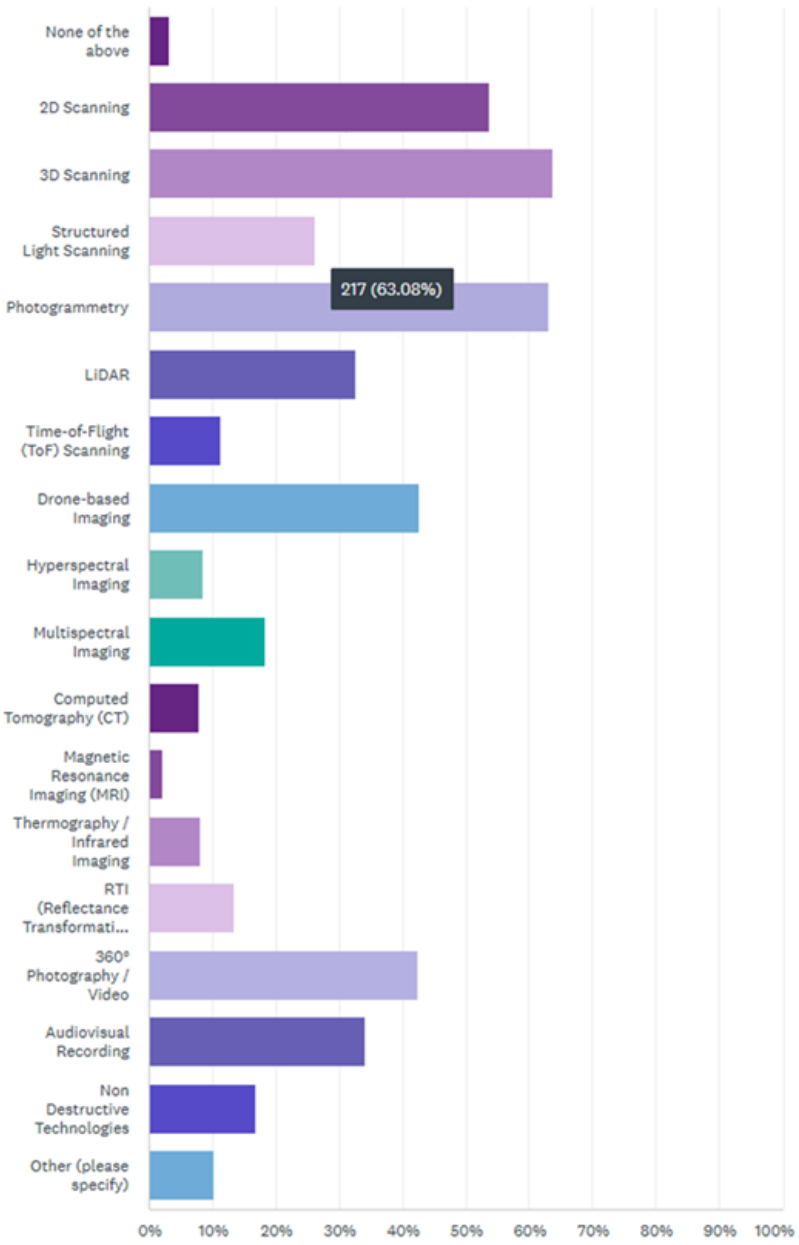

Fig.12 Digital Technologies used in Data Acquisition

Respondents were also asked whether their digitisation projects incorporate analytical or diagnostic tasks, particularly when working with movable or immovable cultural heritage. A substantial portion (43.60%) reported conducting condition assessments as part of their workflows, while conservation diagnostics were cited by 37.21%. Material analysis (31.40%), structural analysis (28.20%), and environmental monitoring (28.78%) were also prevalent, suggesting strong integration between scientific and heritage practices in many institutions. Chemical analysis (15.41%) and biological analysis (7.85%) were less common but still notable in contexts such as archaeological science or organic material preservation.

Interestingly, although 35.47% selected “None of the above,” no respondents indicated a complete absence of these activities across the board. (Fig. 14). This may suggest that such tasks are either carried out through external partnerships or fall outside the direct remit of the respondents’ roles or institutional particularly in cases where the organisation does not manage cultural heritage assets requiring scientific analysis. The integration of analytical and diagnostic methods demonstrates the increasing convergence of conservation science and digital documentation, with many institutions adopting holistic workflows that extend beyond surface capture to include material and environmental understanding.

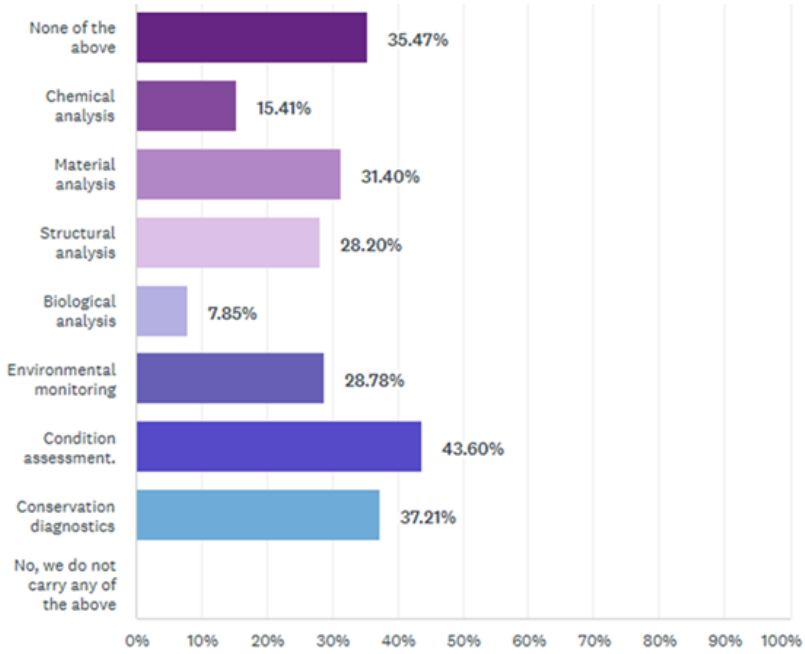

Fig.14 Analytical or Diagnostic tasks carried out with Digital Acquisition

5.2.6 Strategic Priorities and Motivations

To contextualise the technical and operational findings, respondents were asked to reflect on the overarching strategic motivations guiding their digitisation activities. Specifically, they were asked to rank a predefined list of ten objectives according to their organisation’s priorities, with 1 representing the highest priority and 10 the lowest. This question was answered by 344 respondents, while 79 skipped it.

The analysis of ranked responses (aggregated using a weighted scoring method) reveals that long-term preservation and protection of heritage is the most widely prioritised objective, with 51.45% of respondents ranking it as their top goal, and an average score of 8.69, making it the highest-ranked category overall. This indicates a strong preservation ethos underpinning much of the digitisation activity across institutions. Closely following were objectives related to enhancing public access and education (score: 7.98) and supporting research and academic study (score: 7.84). These findings suggest a dual focus: while safeguarding heritage remains

central, there is also considerable emphasis on expanding public engagement and advancing scholarly use of digital collections.

By contrast, objectives such as commercialisation and revenue generation (score: 3.22) and supporting legal, policy, or restitution processes (score: 3.40) scored lowest, with the majority ranking these as lesser priorities. For example, 36.63% ranked commercialisation last. Similarly, goals tied to training and staff development, community co-creation, and innovation/experimentation sat mid-range, reflecting growing but not yet dominant interests in digital capacity-building and emerging technologies. (Fig. 15).

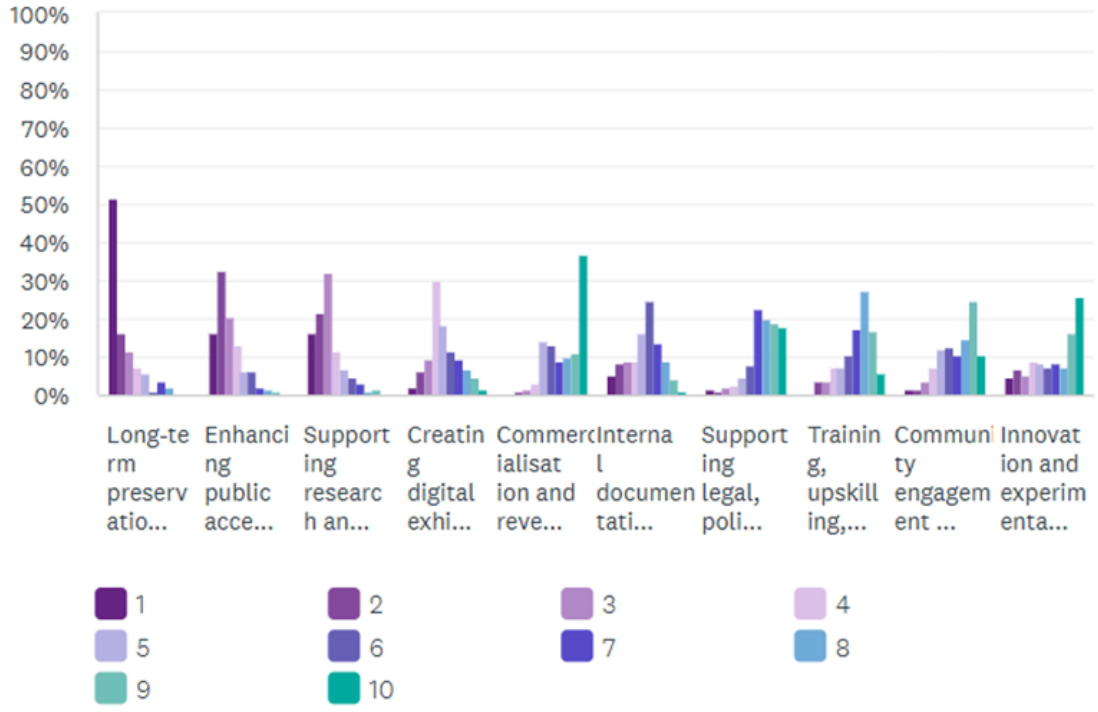

Fig.15 Ranked Order of Prioritisation and Objectives in Digitisation Efforts

It is worth noting that while some respondents may not have ranked certain objectives highly, this does not imply they are irrelevant. Instead, these rankings may reflect the diversity of institutional mandates, resource levels, and national or regional policy priorities. Overall, the data reflects a maturing sector that balances preservation and access objectives, while still negotiating the pressures of limited funding, uneven infrastructure, and evolving digital competencies.

5.2.7 Reuse and Accessibility

Digitisation does not end with data capture; the value of digital cultural heritage assets is often realised in their reuse, discoverability, and integration into institutional systems. Respondents were therefore asked to describe how their digitised assets are reused, stored, and made

accessible. As with previous questions, this set was answered by 344 respondents, with 79 skipping the section.

The most common forms of reuse include educational resources and e-learning, cited by 70.06% of respondents, followed closely by online exhibitions and digital storytelling (66.86%). This suggests a strong pedagogical and narrative-driven approach to reuse, supporting learning and outreach through digital means. Meanwhile, 39.83% use their digitised material in virtual reality (VR) experiences, with 32.56% using augmented reality (AR), and 19.19% employing extended reality (XR) approaches, indicating a growing but still limited uptake of immersive technologies. A modest 15.70% reported commercial reuse, while 20.06% indicated that digitised content is not reused at all, serving preservation-only purposes. 0.76% selected "Other" and detailed a wide range of reuse scenarios beyond the predefined categories. These included conferences, research presentations, and the planning of conservation treatments in collaboration with other researchers, underscoring how digitised assets often play a role in professional exchange and scientific documentation. Others cited reuse in AI model training, applications in Building Information Modelling (BIM) and automated analysis. Several respondents reported uploading material to Google Arts & Culture and other international aggregation platforms outside Europeana, such as Deutsche Digitale Bibliothek (DDB), DigitalPasifik, and Museum-Digital. One participant reuse format mentioned was "Memory Capsules", suggesting participatory or commemorative digital storytelling frameworks. (Fig. 16).

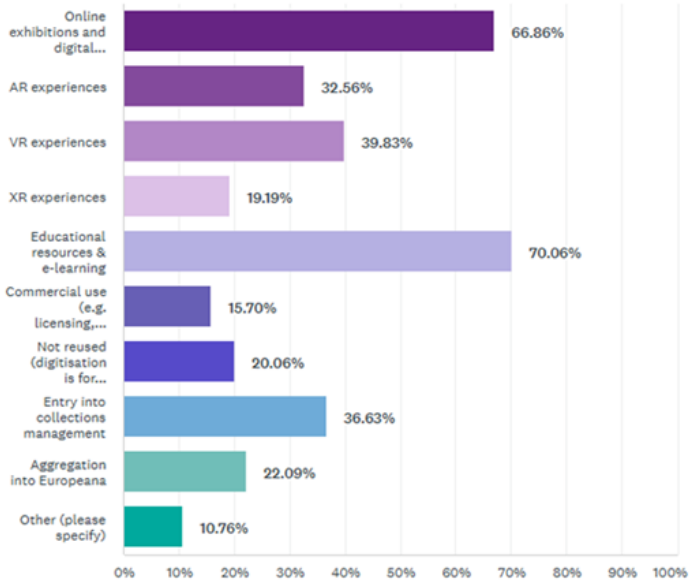

Fig.16 Reuse of prioritisation of Digital Assets

When asked whether their digitised assets are stored in a collections management system (CMS), 57.56% confirmed use of such systems, while 42.44% stated they do not. Among those who provided further details, 24.13% reported using a custom-built in-house system, 20.35% rely on open-source platforms, 10.76% use commercial systems, and 9.88% indicated that their CMS is embedded within a larger institutional IT framework. 28.78% responded "Not

Applicable," suggesting either that they do not use CMSs at all, that they do not need them or that digitisation is not linked to collections management in their institutional setting. The remaining 6.10% provided "Other" responses, which include solutions such as; OpenHeritage 3D, Sketchfab and filemaker. (Fig. 17,18).

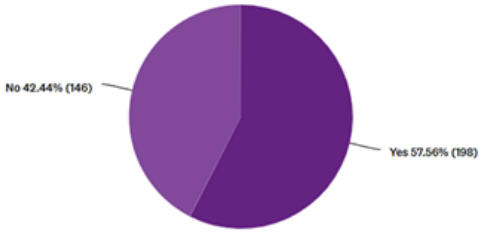

Fig. 17 Use of a Collection Management System

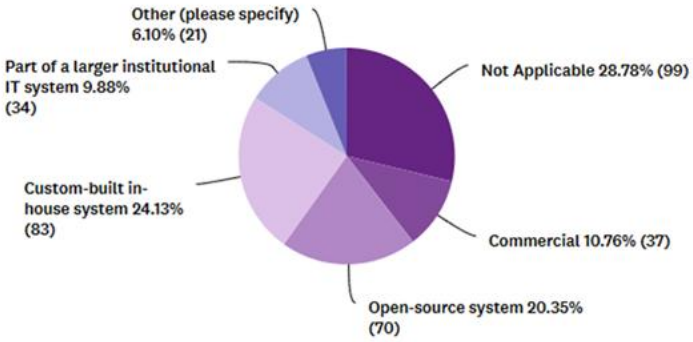

Fig. 18 Type of Collection Management Systems in Use

Accessibility practices reveal a mixed landscape. Just 17.15% reported fully open access, whereas 48.26% provide partial access, often due to rights restrictions, privacy concerns, or institutional policies. A substantial 27.62% limit their digital collections to internal use only, and 6.98% noted that their collections are not yet digitised. (Fig. 19).

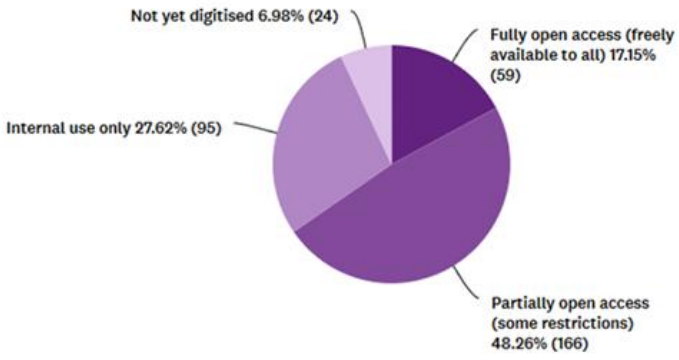

Fig.19 Collection Accessibility

When it comes to licensing, 36.92% of respondents stated that they use Creative Commons (CC) licenses. However, 27.91% do not currently use CC licences, and 20.35% selected “Not Sure,” indicating a possible lack of clarity or institutional policy regarding rights frameworks. 14.83% selected “Not Applicable,” which reflect institutions that do not hold copyright, work with material in the public domain, or manage collections for internal use only – as well as dependent on organisational type the data is being categorised under. (Fig. 20).

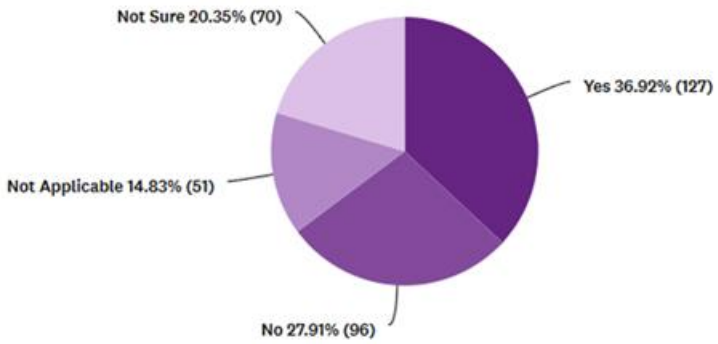

Fig.20 Collection Accessibility

5.3 Advanced Concepts and Standards

Understanding advanced concepts and standards as they currently stand is essential not only to capture a snapshot of present-day practices, but also to evaluate how complex modelling systems, techniques, and tools are being introduced or adopted across cultural heritage institutions.

This includes the evolving integration of BIM, HBIM, and HHBIM methodologies; the consideration of Levels of Detail (LoD) in which they are developed; the use of frameworks for metadata and paradata management; the application of artificial intelligence (AI) within digitisation processes; the adoption of varying ontologies; and the discussion of standards necessary to understand the methodologies, strategies, and institutional contexts that determine their implementation - or, in some cases, their absence. This perspective is essential for assessing the extent to which established frameworks are applied, how they vary in execution, and how such variations influence the quality, interoperability, and sustainability of digitisation outcomes.

Together, these themes form the foundation for assessing the maturity, adaptability, and future readiness of the cultural heritage digitisation ecosystem.

5.3.1 BIM, HBIM, HHBIM, LOD

Building Information Modelling (BIM), Heritage Building Information Modelling (HBIM), and Holistic Heritage Building Information Modelling (HHBIM) were included in the survey to assess

levels of awareness and understanding of these advanced modelling methodologies among cultural heritage professionals. Respondents were also invited to elaborate on their understanding of each concept to provide qualitative insights into how these systems are perceived and applied in heritage contexts.

While BIM is well established in architecture and construction for its application in planning, design, and management, its penetration into the cultural heritage sector shows varied levels of familiarity. Among respondents, 22.32% had not yet heard of BIM, 34.86% reported basic awareness, and 46.79% stated that they understood its meaning. This indicates that nearly half of respondents possess at least some working knowledge of BIM principles and workflows (Fig. 21).

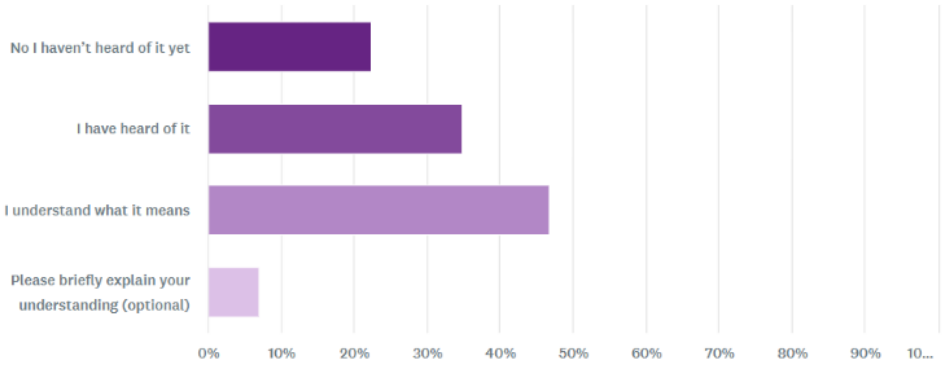

Fig.21 Understanding of BIM

Recognition of the concept of Historic Building Information Modelling (HBIM), which extends BIM methodologies to incorporate architectural detail, historical research, and conservation data, was slightly lower. While 29.36% of respondents had not encountered the term, 30.89% indicated awareness, and 42.51% reported understanding what HBIM involves. These figures suggest that adaptation of BIM-based methodologies into the heritage field is progressing, with professionals increasingly recognising HBIM's potential to enhance documentation, conservation, and virtual representation of historic structures (Fig. 22).

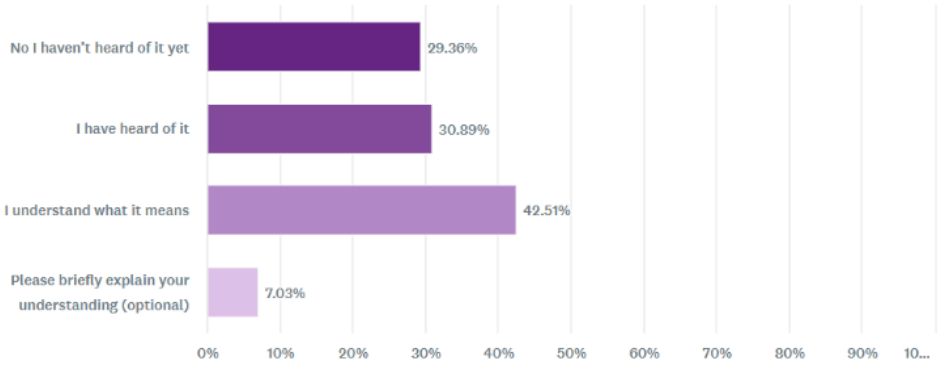

Fig.22 Understanding of HBIM

When the scope was further narrowed to Holistic Heritage Building Information Modelling (HHBIM), a more recent conceptual framework integrating cultural significance, collective memory, and conservation ethics into the modelling process - familiarity dropped considerably. Nearly 45% of participants had not heard of HHBIM, and only 28.75% expressed a degree of understanding. This reflects both the gradual adoption and limited dissemination of the HHBIM framework, which is still in the process of gaining traction within institutional and professional workflows (Fig. 23).

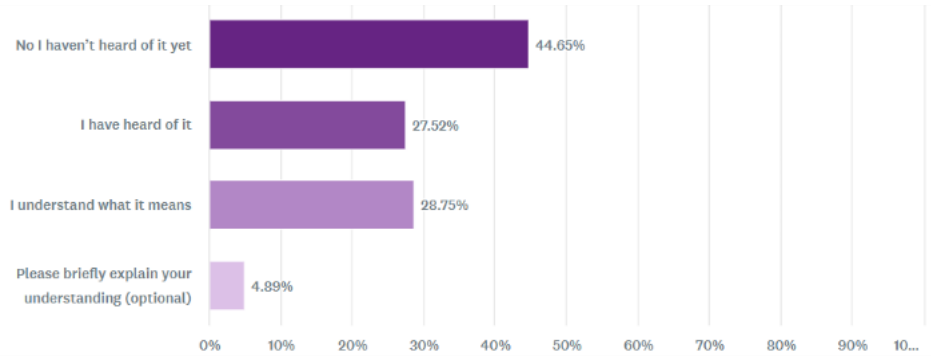

Fig.23 Understanding of HHBIM

Participants who indicated familiarity with these modelling concepts were subsequently asked to identify the Level of Detail (LoD) applied to their 3D models. The results reveal limited knowledge of or engagement with LoD classifications, which are critical standards that define the resolution, geometry, semantics, and material attributes of digital models. Over 40% of respondents had never heard of LoD standards, while a further 37.61% reported uncertainty about which levels their models conformed to. Only a small minority identified using LoD 300 or higher, typically considered appropriate for detailed analysis, conservation planning, or structural monitoring (Fig. 24).

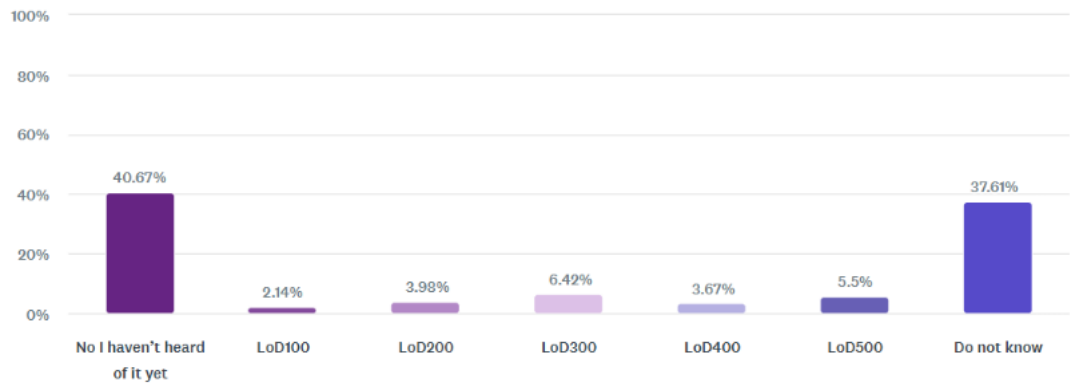

Fig.24 Understanding and Use of LoD

These findings suggest a promising but uneven engagement with advanced digital modelling standards. While BIM and HBIM are becoming more visible in heritage digitisation, the uptake of

HHBIM and related concepts such as LoD classification remains fragmented. This disparity highlights the necessity for targeted training, clearer heritage-specific documentation standards, and perhaps the development of new interpretive frameworks that better align these technical methodologies with conservation ethics and curatorial needs.

5.3.2 Digital Twin and Memory Twin

Digital Twins and Memory Twins represent two significant frameworks within the digitisation of cultural heritage both as technical concepts and as evolving philosophies of digital preservation and interpretation. Both reflect an ambition to create and move beyond static 3D representations toward dynamic systems that sustain a continuous relationship between the physical and digital realms. In this sense, they are not just important but increasingly foundational to how heritage is understood, managed, and communicated in the digital age.

The survey explored the level of awareness and understanding of both concepts among participants, with the option to elaborate on their interpretations.

Results show a relatively strong familiarity with Digital Twins, with 55.05% of respondents indicating that they understand the concept, 33.03% reporting basic awareness, and only 16.21% stating they had not encountered it before. Free-text responses highlighted both sophistication and ambiguity in interpretation. Several respondents described Digital Twins as "dynamic representations of a (heritage) asset" capable of integrating real-time or periodic updates to reflect the asset's evolving condition. However, others cautioned that the term is sometimes misapplied as a synonym for static 3D models, "without any component intelligence or flow of information." Others echoed this, distinguishing digital twins as "exact replicas" that should ideally be synchronised with the physical asset through continuous updates. Such responses reveal a conceptual maturity within the sector yet underline the need for clearer guidance and shared standards in defining and implementing Digital Twins. (Fig. 25).

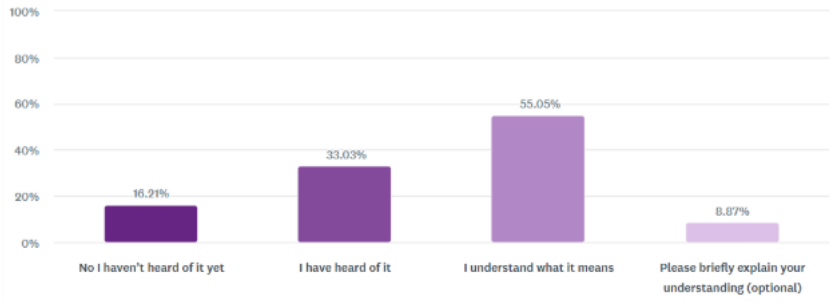

Fig.25 Awareness and Understanding and Digital Twin

When asked about Memory Twins, responses demonstrated a high degree of awareness and engagement: 96.94% of participants indicated familiarity (45.87%) or understanding (51.07%), with only a marginal fraction skipping the question. This result suggests that the heritage

community is increasingly embracing interpretative and narrative-driven approaches to digitisation. (Fig. 26).

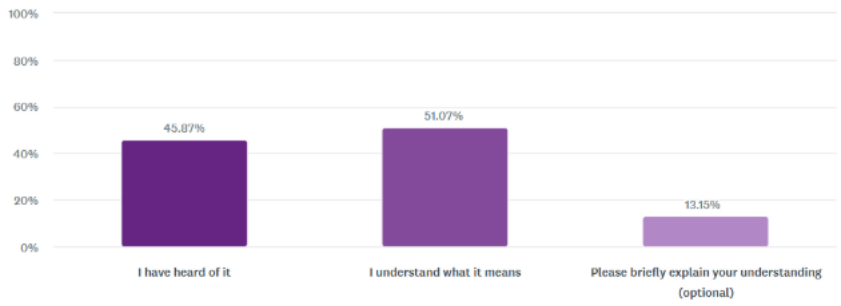

Fig.26 Awareness and Understanding and Memory Twin

Qualitative insights provided in the open-text fields emphasised that Memory Twins are understood as digitally enriched surrogates that transcend physical replication. They embed the intangible dimensions of heritage; stories, memories, rituals, and evolving meanings; creating digital entities that preserve not only form but also context, experience, and identity. Respondents referenced the importance of preserving the intangible and contextual layers of heritage, including the memory of use, meaning, and transformation over time. They described them as frameworks that "keep memory alive," ensuring that the social, emotional, and symbolic values of heritage are not lost in the translation to digital form.

The distinction between Digital and Memory Twins is brought to light, signalling a conceptual evolution in the field: from digitising objects to digitising relationships and meaning. While Digital Twins provide a foundation for monitoring, management, and simulation, Memory Twins extend this by embedding collective memory, narrative, and continuity, therefore defining a new paradigm where digital heritage is not a mirror of the past, but an active medium through which heritage lives, transforms, and is reinterpreted over time.

As such, the high awareness and interpretive richness captured in this section point toward an expanding professional consciousness which recognises the need for digital tools not only to document heritage but to sustain its living significance.

5.3.3 AI

AI has become a central topic in discussions about the future of cultural heritage digitisation, particularly in the context of automation, predictive modelling, and the enhancement of large and complex datasets. Its increasing visibility across EU policy frameworks, including the *European Artificial Intelligence Act*, makes it a timely and necessary area of inquiry. To assess the current state of practice, the survey asked respondents whether AI is currently used in their documentation workflows, and if so, at which stages of the process.

The results reveal that while awareness and interest in AI are growing, practical implementation remains limited. A majority of respondents (62.08%) indicated that they do not currently use AI in their documentation processes. Among those who do, usage is distributed across several stages of the workflow, reflecting emerging experimentation rather than widespread integration. The most common area of application is post-processing (23.55%), where AI is likely used to clean, structure, or semantically enrich datasets after acquisition. This is followed by visualisation (17.13%), suggesting that AI tools are increasingly leveraged for rendering, interpretive generation, or automation of visual outputs. AI use was also reported in data filtering (15.29%) and modelling (14.07%), highlighting its role in managing point cloud density, improving geometric consistency, or producing predictive surfaces. The lowest rate of adoption was observed in data acquisition (13.15%), a stage still dominated by manual and hardware-dependent processes. (Fig. 27).

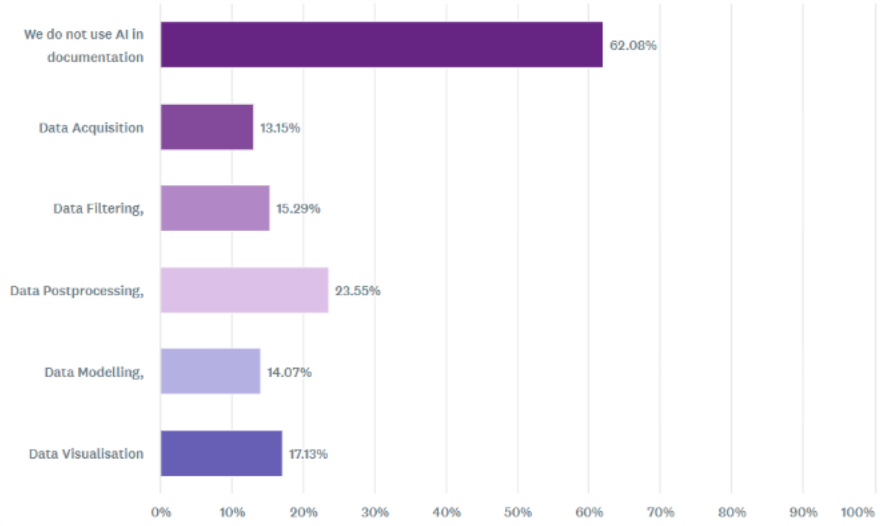

Fig.27 Use and Stages of AI

While overall adoption remains relatively low, the distribution of responses suggests that AI is beginning to enter the heritage digitisation workflow primarily at later stages, where efficiency, optimisation, and data enhancement are most readily achieved.

5.3.4 Digital Strategies, Standards and Methodologies

Understanding how institutions organise, regulate, and align their digitisation efforts is critical for assessing the maturity and coherence of the wider cultural heritage ecosystem. Standards and strategies, whether institutional, national, or international, form the framework through which digitisation practices are planned, implemented, and sustained. They determine not only the consistency and interoperability of data, but also the long-term accessibility, preservation, and reusability of digital cultural heritage. Given the broad range of stakeholders involved in digitisation alignment between these frameworks is essential. However, the diversity of institutional mandates and regional contexts often leads to variation in how standards are interpreted and applied. The survey therefore sought to investigate the extent to which respondents' institutions follow internal, national, or international strategies for digitisation, and to what degree formal standards and methodologies guide their practices.

A total of 306 respondents provided insights into the extent to which their institutions align with national or internal strategies for digitisation. Just over a third (35.29%) indicated that their institution follows or aligns with an existing national strategy for the digitisation of cultural heritage, where such a strategy exists. However, this figure is closely matched by the 31.05% who reported not aligning with any national strategy and not being aware of one in their country. A further 15.69% stated that they do not follow a national strategy despite being aware of its existence, and nearly 18% expressed uncertainty or lack of knowledge on the matter. These figures suggest a fragmented or uneven landscape in terms of national coordination on digitisation efforts, with a significant portion of institutions either operating independently or lacking awareness of higher-level frameworks. (Fig. 28).

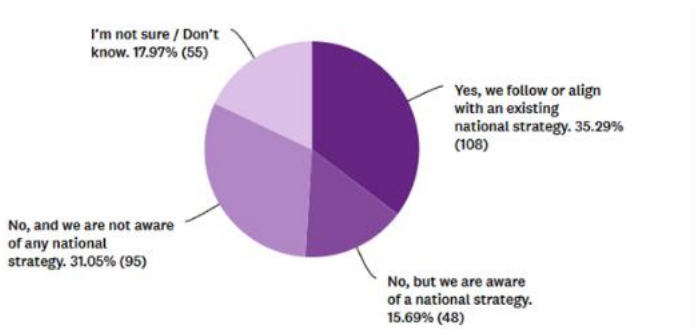

Fig.28 Organisational Alignment with a National Strategies

At the institutional level, the presence of internal strategies for digitisation is similarly varied. Only 28.10% of respondents reported having a formal strategy with clearly defined goals. A slightly higher proportion (29.08%) stated that they operate under informal guidelines, suggesting that while some planning and direction exist, they may not be formally structured or enforced. A further 14.71% indicated that while no strategy is currently in place, one is under development. An equal proportion to those with formal strategies (28.10%) reported no internal digitisation strategy at all. This parity between institutions with and without structured planning frameworks highlights the ongoing need for clearer guidance, policy consolidation, and institutional support mechanisms across the sector. (Fig. 29).

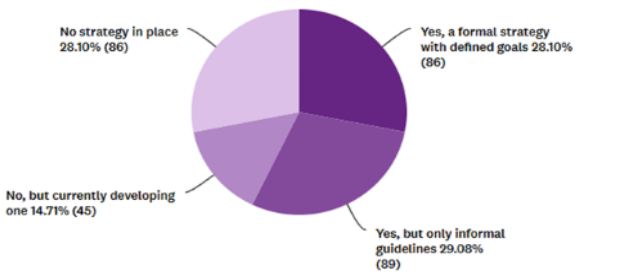

Fig.29 Organisational Strategies

When asked about the presence of formal quality standards or guidelines across different stages of the digitisation process, responses reflected further disparities. The most common area with established standards was acquisition and digitisation, cited by 54.90% of respondents. Metadata creation followed, with 41.50% indicating the use of controlled vocabularies or metadata standards such as *Dublin Core*, *LIDO*, or *CIDOC-CRM*. Far fewer participants (23.53%) reported having formalised approaches to documenting paradata as the records of decisions, methodologies, and contextual factors underpinning the digitisation process. Notably, 18.63% of participants reported using no formal standards or guidelines in any of these domains, and around 20.59% were unsure whether such measures existed within their organisation. (Fig. 30).

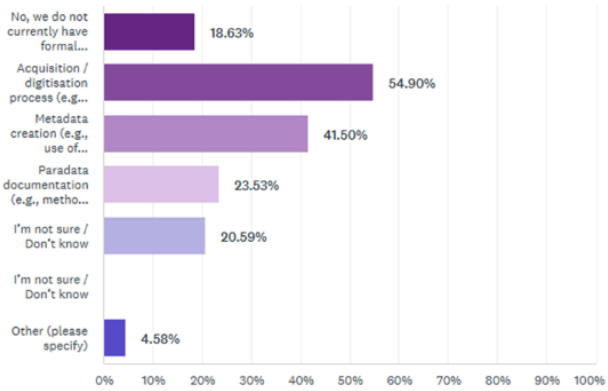

Fig.30 Institutional (or individual) Organisational Strategies

This distribution suggests that while technical processes such as acquisition are more likely to follow standardised protocols, the interpretive and process-oriented dimensions of digitisation, particularly metadata and paradata management, remain inconsistent or underdeveloped. The results underscore the importance of continued investment in the development and dissemination of coherent methodological frameworks that bridge technical and semantic interoperability across cultural heritage domains.

5.3.5 Data Collection, Paradata and Metadata and Digital Ontologies

Documentation is the foundation of sustainable digitisation. Beyond the creation of digital surrogates, the capture of contextual, interpretive, and technical information determines whether digital heritage assets remain meaningful, reusable, and interoperable in the long term. Understanding how institutions record paradata and metadata, as well as the extent to which they engage with ontological frameworks, offers valuable insight into the maturity and transparency of the sector's documentation practices.

These elements are crucial for several reasons. Metadata ensures discoverability and accessibility, providing structured descriptions of an object's attributes, provenance, and relationships. Paradata captures the decision-making processes and methodologies that underpin digitisation, offering accountability and interpretive depth. Ontologies, in turn, allow for semantic connections across datasets, enabling interoperability between institutions and systems. Together, these practices form the connective tissue between technical digitisation and cultural meaning, bridging data with interpretation, and ensuring that digital representations remain traceable, contextualised, and credible over time.

When asked whether their institutions collect the historical or cultural context surrounding digitised objects or sites, 46.08% of respondents stated they do so *partially*, though this information is not always consistently linked to the digital asset. A further 25.16% indicated that they do not collect such data at all, while only 18.63% affirmed active and structured collection practices, often through metadata fields, embedded annotations, or linked external platforms. A further 10.13% are unsure if they collect this data. (Fig. 31).

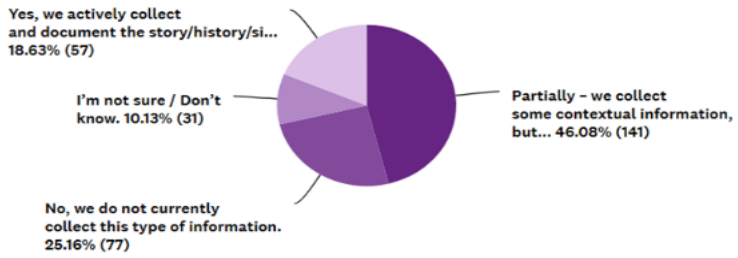

Fig.31 Institutional or (Internal) Organisational Strategies

In terms of paradata, the majority reported collecting digitisation settings (67.65%), location data (56.21%), and post-processing details (48.04%). Less frequently, though still significant, were workflow documentation (45.75%), calibration data (24.51%), and records of methodological decision-making (25.49%). Only 16.99% of respondents reported capturing environmental or weather data during documentation, a factor increasingly relevant to outdoor heritage and climate-sensitive contexts. (Fig. 32).

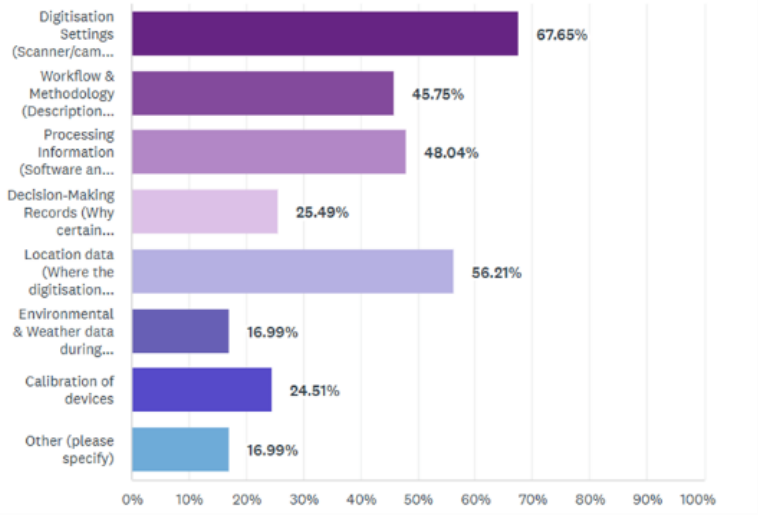

Fig.32 Paradata Collection

When asked about metadata usage, 57.19% of respondents confirmed that they do employ metadata, while 42.81% stated that they do not. Among those who do, *Dublin Core* was the most frequently cited schema (26.47%), followed by *LIDO* (8.50%) and a variety of "Other" standards (18.95%). Interestingly, 54.90% marked "Not applicable," suggesting either non-use, uncertainty, or a lack of familiarity with established metadata structures. This reveals a clear divide between respondents employing structured metadata systems and those relying on ad hoc or undocumented approaches. (Fig. 33).

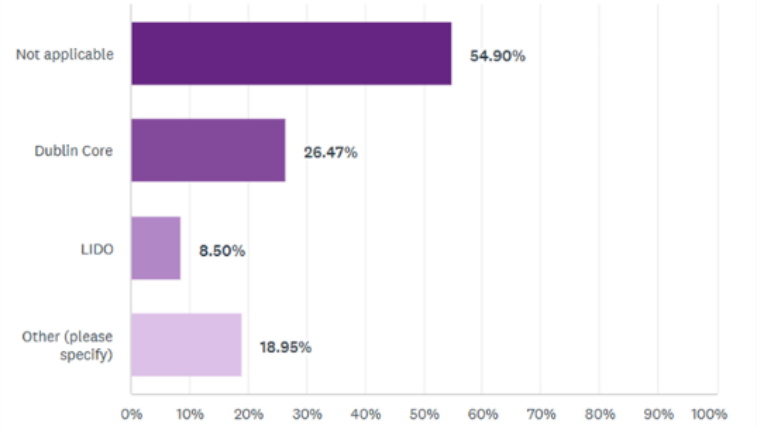

Fig.33 Metadata Usage

Regarding data presentation formats, 27.78% of respondents primarily use *point clouds*, followed by *triangulated mesh structures* (25.82%) and *surface models* (20.92%). A further 25.49% reported using other or mixed formats, reflecting the diversity of tools and workflows in use. These figures point to a heterogeneous technical landscape, shaped by institutional capacity, project requirements, and available infrastructure. (Fig. 34).

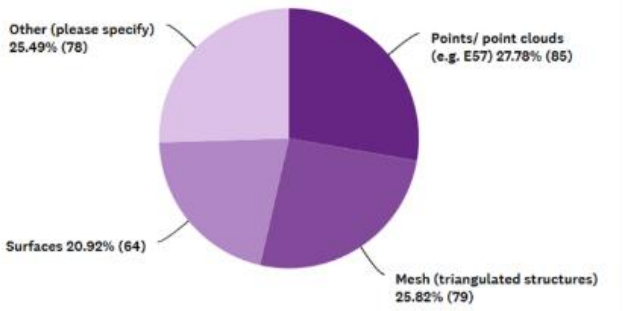

Fig.34 Data Presentation Formats

Finally, when asked about ontological frameworks, only 17.32% of respondents confirmed using *CIDOC-CRM*, the most widely recognised international standard for cultural heritage semantics. In contrast, 34.64% stated that they do not use any ontology, while a substantial 43.46% were unsure. This lack of clarity underscores the limited integration of semantic frameworks into practical workflows and highlights a broader gap in awareness or expertise. Among those who do apply ontologies, 8.17% referenced alternatives such as *Getty AAT*, *RiC-O*, *CRM*, *LRM*, *YSO*, and *KOKO*. (Fig. 35).

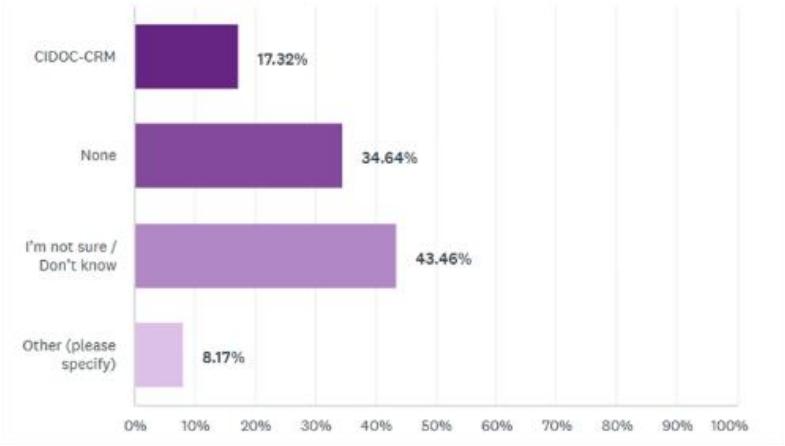

Fig.35 Ontological Frameworks

Taken together, these findings illustrate a sector that is increasingly attentive to the need for documentation transparency but still marked by inconsistency in practice. While metadata usage is becoming more standardised, paradata collection and ontology adoption remain uneven, limiting the potential for interoperability, long-term preservation, and cross-institutional collaboration.

5.4 Engagement with European Frameworks

While the previous sections explored institutional strategies, documentation methodologies, and standards at the local and organisational levels, this section turns toward the broader European context within which digitisation activities increasingly operate. As the cultural heritage sector continues to evolve under the influence of digital transformation, the European Union has positioned itself as a key policy and funding driver through initiatives such as *Europeana*, the *European Archival Framework*, and the *Common European Data Space for Cultural Heritage*. These frameworks collectively aim to promote interoperability, accessibility, and sustainable stewardship of cultural data across member states and beyond.

For institutions and professionals active in the field, alignment with these European agendas carries both opportunities and challenges. On one hand, EU programmes provide funding, infrastructure, and shared standards that facilitate collaboration and innovation. On the other, many organisations, particularly those outside the EU or operating with limited resources, face barriers related to technical capacity, awareness, and policy integration. Understanding how the community engages with these frameworks therefore provides valuable insight into the degree of European cohesion in digital heritage practices and the inclusivity of these initiatives across different geographic and institutional contexts. This section of the survey sought to assess the sector's awareness, participation, and perceived challenges in relation to key European frameworks.

5.4.1 EArchiving and Digital Preservation

The *EU eArchiving initiative* represents a core component of the European Commission's efforts to ensure the long-term preservation, accessibility, and interoperability of digital information. It provides technical specifications, standards, and guidance to support institutions in the sustainable management of digital records and heritage assets. As such, awareness and adoption of this framework are key indicators of how effectively European strategies for digital continuity are cascading to the institutional level.

The survey responses, however, reveal a considerable awareness gap regarding the initiative. Only 33.66% of respondents indicated that they had heard of the *EU eArchiving* initiative, while a clear majority (66.34%) were not familiar with it (Fig. 36). This disparity highlights a disconnect between EU-level preservation policy and on-the-ground practice, particularly among smaller institutions or those operating outside formal European funding or governance structures.

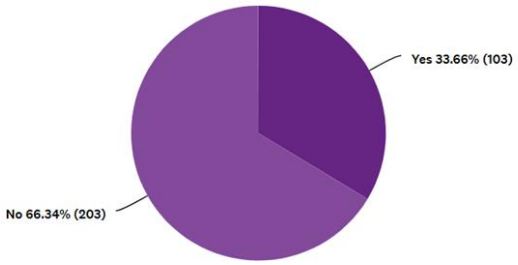

Fig.36 *Eu Archiving Initiative* Awareness

When asked about their biggest concerns regarding digital preservation, respondents overwhelmingly identified long-term digital storage and sustainability as their top issue (83.66%). This reflects the sector's ongoing struggle to ensure that digital assets remain accessible and authentic over extended timeframes. Technological obsolescence followed at 55.23%, signalling persistent anxiety around the rapid pace of technological change and its impact on data integrity. A lack of trained personnel (46.41%) was also cited as a critical barrier, reinforcing the need for capacity-building and specialised digital preservation training within cultural institutions.

Other major concerns included copyright and legal issues (42.16%), indicating that uncertainty around intellectual property and data protection continues to affect digitisation and sharing practices. Public engagement and accessibility (36.60%) were also identified as a challenge, underscoring that preservation alone is insufficient without ensuring meaningful and equitable access to cultural content.

Finally, open-ended responses (9.48%) expanded on these issues, citing additional concerns such as hacking and cybersecurity threats, lack of standardisation, dependence on proprietary tools, insufficiently open-source or cost-effective preservation solutions, interoperability limitations, and the long-term financial burden of maintaining digital repositories. These insights collectively emphasise that while the principles of sustainable digital preservation are widely recognised, practical implementation across Europe and beyond remains inconsistent and uneven. (Fig. 37).

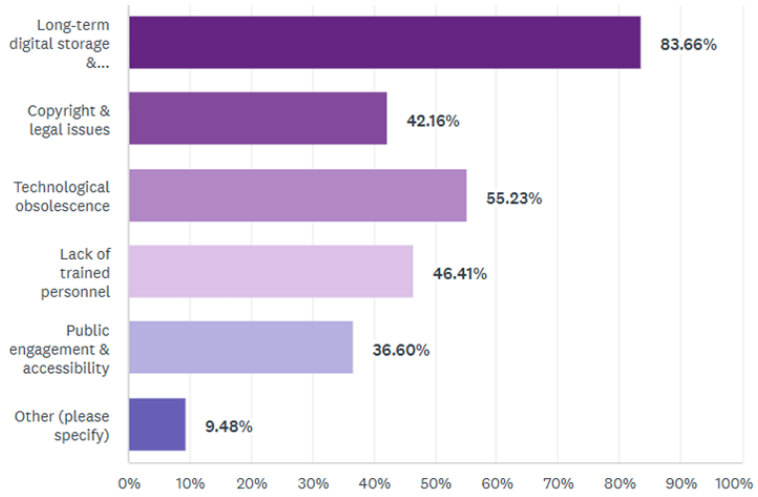

Fig.37 Concerns regarding Digital Preservation

5.4.2 Europeana

Europeana represents the European Union's flagship platform for digital cultural heritage aggregation, access, and reuse. Conceived as both a repository and a network, it serves as the digital interface of Europe's shared heritage, connecting national and institutional collections to a common data space. Its role within the wider European framework is therefore pivotal, not only in setting standards for metadata interoperability and open access, but also in shaping the collective vision of a connected and inclusive European cultural heritage ecosystem.

The survey findings reveal, however, that while Europeana's name recognition is strong, active engagement remains uneven and limited in scope. Out of 301 respondents, a substantial majority (64.12%) reported familiarity with Europeana, and an additional 17.61% had at least heard of it, though were unsure of its function. Only 16.61% indicated no familiarity at all. (Fig. 38).

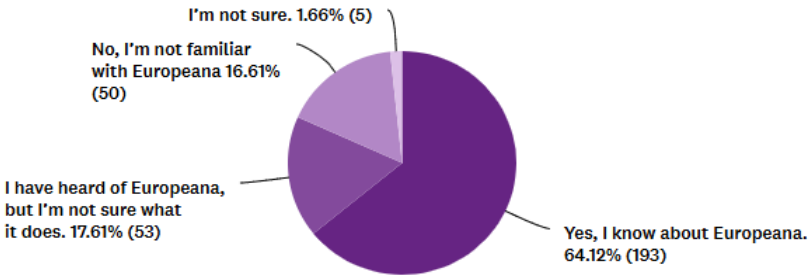

Fig.38 Level of Familiarity with Europeana

Despite this baseline awareness, the proportion of respondents aware of an active interaction with Europeana is significantly lower. Fewer than a third (27.91%) use Europeana for information, 13.95% reuse content, and only 3.65% contribute new material through harvesting

workflows. More than half (54.49%) reported not using Europeana in any capacity. This discrepancy between awareness and use suggests that while Europeana is recognised as an important platform, (the visibly on) its practical integration into institutional workflows remains inconsistent. (Fig. 39).

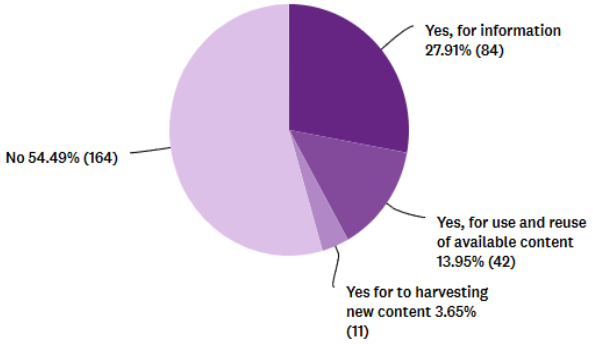

Fig.39 Use of Europeana

When asked about their institutional relationship with Europeana, responses further underscored this gap between intention and implementation. The largest single group (42.52%) stated they do not currently have a relationship but would be interested in establishing one, while 20.93% were unaware of any existing connection or opportunity to participate. Active contributors remain a minority: 12.96% currently contribute content via a national aggregator, 12.29% are members of the Europeana Network Association, and 11.30% have some relationship without having contributed content. (Fig. 40).

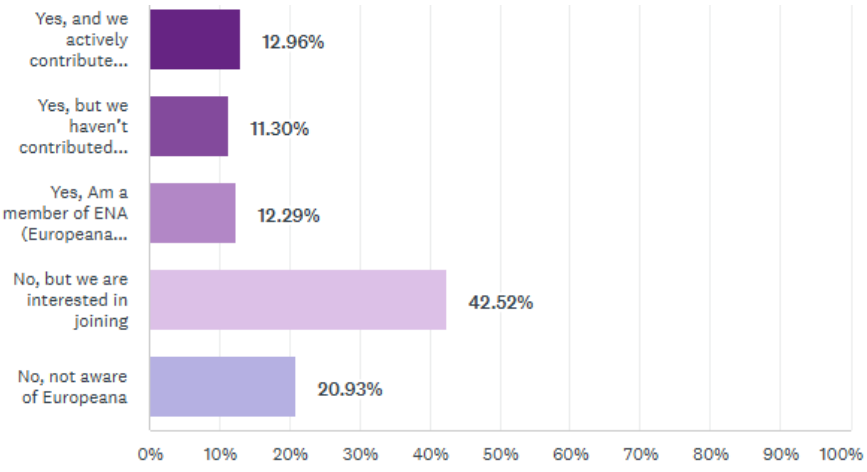

Fig.40 Relationship with Europeana

Among the institutions that do work with Europeana, the scale of published collections remains modest. The 38.87% who report actively contributing to Europeana. make small portions of their holdings available: 12.96% have less than 10% of their collection online, and only 3.32% have more than half of their collection accessible through Europeana. Another 15.28% were unsure

of the extent of their online representation. (Fig. 41). This uneven participation highlights both resource and infrastructural disparities between institutions, as well as differing levels of integration with national aggregation frameworks.

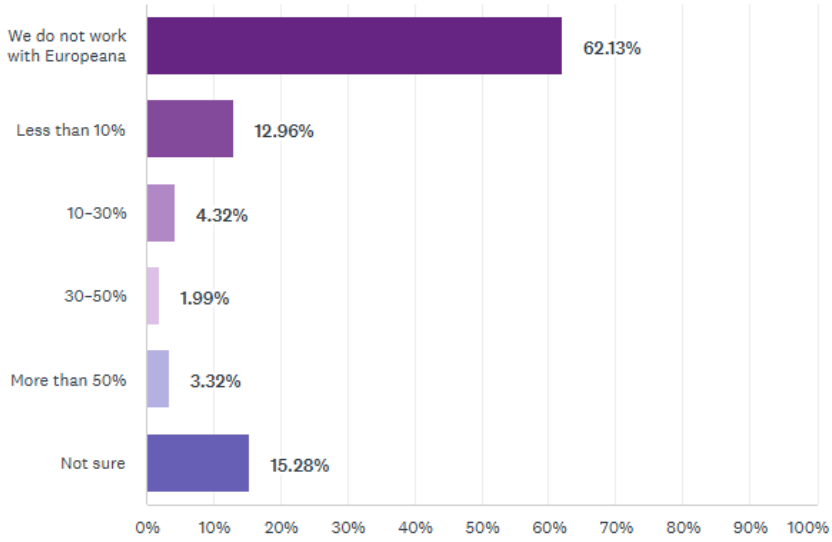

Fig.41 Percentage of Online Collections

Participants were also asked to identify the challenges they face in engaging with Europeana. While over a third (36.54%) reported encountering no difficulties, many others described notable barriers. The most frequently cited included a lack of internal understanding of Europeana's purpose or benefits (22.59%), technical or procedural complexity in data preparation and ingestion (17.94%), and limited institutional capacity, both in staffing and technical resources (19.93%). Concerns around metadata strictness and interoperability (10.96%), rights clearance and licensing (16.28%), and insufficient national aggregator support (11.96%) further underscore the operational challenges institutions face. (Fig. 42).

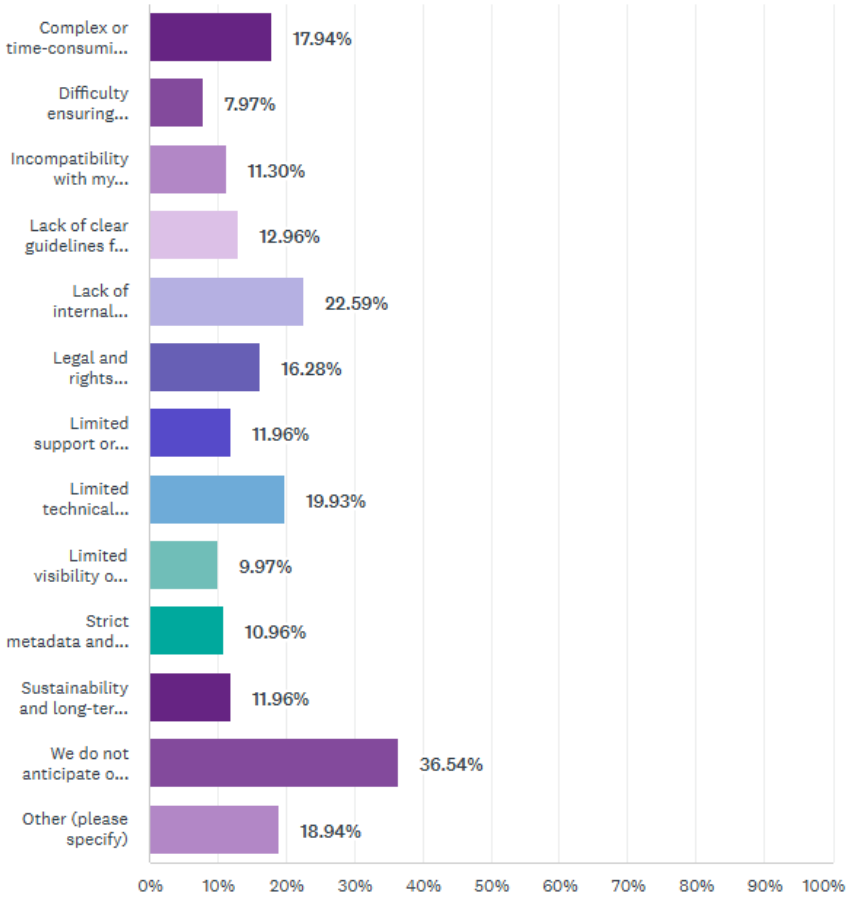

Fig.42 Challenges with Europeana

The open-text responses provide a nuanced view of these issues, shifting from technical to relational concerns. Participants highlighted sustainability of engagement and long-term reciprocity as pressing issues, noting that once content is harvested, there is often little incentive or structural support to update or expand upon it. Others questioned format limitations, citing the platform's insufficient accommodation of non-visual media such as acoustic or multisensory data. One respondent noted, "There is no incentive to update content that has been harvested a long time ago. Europeana should invest more in their direct relationship with existing content providers and incentivise updating or new content ingestion."

Collectively, these findings reveal that Europeana's ecosystem, while central to the European cultural heritage infrastructure, faces persistent challenges in translation from policy vision to institutional reality. The data suggests that engagement barriers are not merely technical; they are structural, communicative, and strategic, rooted in questions of capacity, control, and mutual benefit. Strengthening these relationships will require a more sustained dialogue between Europeana and its institutional partners, one that not only promotes access and aggregation but also encourages long-term collaboration, capacity-building, and shared ownership of digital heritage futures.

5.4.3 Common European data space for cultural heritage

The Common European Data Space for Cultural Heritage represents one of the European Union's most ambitious initiatives for developing trustworthy, interoperable, and sustainable data sharing across the cultural heritage ecosystem. Conceived as a cornerstone of the EU's digital strategy, the data space seeks to enable a cohesive environment where heritage institutions, researchers, and creative industries can collaborate, reuse, and build upon digitised cultural resources in line with FAIR (Findable, Accessible, Interoperable, Reusable) principles.

However, survey responses indicate that awareness of this framework remains limited across the sector. Out of 296 respondents, only 18.92% stated they were familiar with the Data Space for Cultural Heritage, while a further 13.18% acknowledged some general awareness. Another 20.61% had heard of the initiative but were uncertain of its purpose, and the largest group at 41.89% reported no familiarity at all. A small portion (5.41%) remained unsure. (Fig. 43).

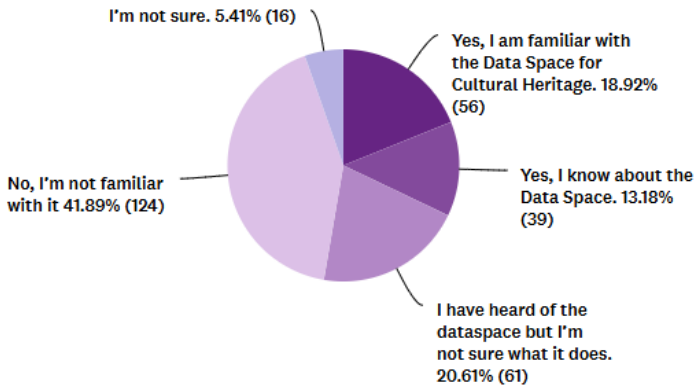

Fig.43 Awareness of the Common European Data Space for Cultural Heritage

This distribution points to a clear knowledge and communication gap between EU-level digital policy and institutional realities on the ground. Despite the initiative's central role in shaping Europe's future digital heritage infrastructure, most heritage professionals remain disconnected from its objectives and potential benefits. The data space is intended to facilitate not only data exchange but also sector-wide digital cohesion yet the survey suggests that this vision is not yet widely understood.

5.5 Community needs and Perspectives.

Understanding the support needs of the cultural heritage sector is essential to contextualise the broader realities of digitisation practice. While previous sections explored workflows, standards, and technological capacities, this final section focuses on the human, institutional, and structural dimensions that determine the sustainability and scalability of digitisation initiatives. Identifying where support is most urgently required provides critical insight into the

sector's operational resilience, revealing not only gaps in resources and infrastructure, but also the priorities and aspirations of those working directly with cultural heritage data.

This part of the survey also sought to understand how professionals envision future collaboration, whether through shared infrastructures, policy frameworks, or international networks and to gauge the community's willingness to stay engaged in shaping the next phases of collective digital heritage development. The results therefore offer a grounded view of what the sector needs, where it seeks alignment, and how it imagines progress.

When asked what type of support would most benefit their digitisation work, an overwhelming 82.49% of respondents identified funding and financial support as their top need. This was followed closely by calls for training and capacity building (55.56%) and international collaboration and networks (55.22%). Respondents also underscored the importance of technical guidance and standards (46.13%), access to digitisation equipment (42.42%), and dedicated infrastructure or workspace (38.05%). A smaller proportion (25.25%) highlighted the need for policy or legal frameworks to strengthen long-term sustainability. (Fig. 44).

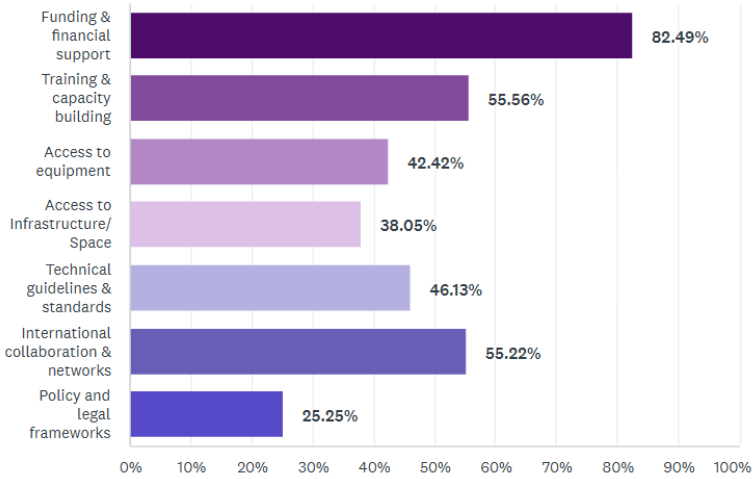

Fig.44 Type of support that would benefit participants digitisation work

When invited to consider joining an international network for cultural heritage data acquisition, 68.35% of respondents responded positively, with a further 29.97% expressing conditional interest depending on alignment with their institutional goals. This strong majority reflects a widespread appetite for transnational community-building, shared methodologies, and cross-border data exchange.

A concluding question asked whether participants would like to receive the survey summary and recommendations. An encouraging 78.11% expressed interest and provided their contact details, underscoring the sector's openness to continued dialogue and collaborative knowledge-sharing.

The final open comments section yielded a broad range of reflections; from appreciation of the initiative to constructive critiques regarding terminology and inclusivity. Taken together, the responses in this section reveal both the pragmatic realities and the aspirational vision of the global digitisation community. While financial and infrastructural challenges remain central concerns, the overarching sentiment is one of momentum, cooperation, and collective purpose; a shared determination to advance standardisation, capacity building, and inclusivity in shaping a more resilient and representative future for digital cultural heritage

6 Concluding Remarks

This report presents the available results of the HERITALISE international survey and confirms the successful completion of the data collection phase. All survey responses have been gathered, consolidated, and are reported within this document. The results are therefore fully available and are a reliable basis for understanding current digitisation practices, needs, and emerging directions within the global cultural heritage sector.

However, it is explicitly noted that this report does not include a dedicated discussion or analytical synthesis chapter. At the time of submitting this report, HERITALISE consortium partners were actively engaged in the in-depth analysis of the large and complex datasets generated by the survey.

The survey has already been positively received by the international multidisciplinary community, demonstrating strong engagement across all sectors of digital cultural heritage. On the basis of the available results, the emerging State-of-the-Art Review provides a comprehensive overview of the current landscape of cultural heritage digitisation. It maps prevailing methodologies, technologies, and operational workflows, identifies key challenges related to interoperability, data accessibility, and standardisation, and highlights emerging trends such as the integration of artificial intelligence and the increasing need for harmonised metadata and paradata frameworks.

While these themes are clearly visible within the reported results, their critical discussion, cross-analysis, and interpretive consolidation are still in progress. Premature inclusion of a discussion chapter at this stage would risk oversimplification and would not adequately reflect the complexity of the dataset or the analytical standards required by the project. For this reason, additional time is necessary to complete the analytical phase and to finalise the discussion in a coherent, evidence-based, and methodologically sound manner.

This document presents the results of the current review of the State-of-the-Art on Techniques, Methodologies and Best Practices in the Field of Digitisation of Cultural Heritage. This work was based on the combined efforts of Heritage Malta, the UNESCO Chair on Digital Cultural Heritage at the Cyprus University of Technology, and collaborators under the HERITALISE Horizon Europe Project (Project No. 101158081).

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