D2.2 Inclusion & accessibility by design methodologies

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Glossary

Term	Definition
3D	3-Dimensional
AD	Audio Description
AI	Artificial Intelligence
CCI	Creative and Cultural Industries
CH	Cultural heritage

DCH	Digital cultural heritage
DMX	Digital Multiplex
DPOs	Disabled People Organisations
EU	European Union
GLAM	Galleries, Libraries, Archives, and Museums
MMDO	multimodal digital object
PAB	Project Advisory Board
WCAG	Web Content Accessibility Guidelines
WP	Work package

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Executive Summary

This deliverable, "*Inclusion and Accessibility by Design Methodologies*," outlines methodologies for inclusion and accessibility by design, based on an extended review of practices within the Creative and Cultural Industries (CCI). It identifies effective methodologies for inclusive digital interactions and provides practical recommendations for broader inclusion.

The deliverable examines existing design methodologies by reviewing current practices and identifying gaps in their application, particularly within the CCI. It proposes innovative strategies that address the challenges of implementing inclusive and accessible digital interactions, focusing on diverse user needs. Key sections explore the theoretical frameworks relevant for inclusion and accessibility, such as Universal Design and Inclusive Design principles, and examine participatory approaches that actively involve end-users in the design process.

The report also reviews existing methodologies adopted in cultural institutions, identifying barriers such as technological limitations and organisational constraints that hinder broader adoption. It examines the role of technological tools, including haptic feedback, virtual reality, and other multisensory technologies, as transformative enablers of equitable participation in cultural heritage experiences. Furthermore, the deliverable analyses relevant policies, highlighting their strengths while addressing gaps, particularly in multisensory and data-driven approaches.

Contributions from project partners are presented, demonstrating collaborative efforts in co-creation workshops and participatory design activities to help explore the integration of user-centred methodologies in our work. The interview study further explores lived experiences of one of our target user groups, identifying opportunities and barriers experienced in interactions with cultural assets. These insights are gathered to help the project develop practical, inclusive solutions that meet real needs. By combining research, partner efforts, user insights, and practical applications, the deliverable provides an improved understanding of how to better achieve accessibility and inclusion within CCI for a meaningful and equitable participation in cultural heritage experiences for all.

1. Introduction

1.1 Aim and scope of the deliverable

This deliverable aims to review inclusion and accessibility by design within the Creative and Cultural Industries (CCI) and propose approaches for enhancing digital interactions. The document presents relevant literature reviews to explore gaps in current practices. It also provides a brief overview of some of the related efforts and studies conducted by the project partners, and outlines strategies to ensure that digital cultural experiences are inclusive for diverse user groups, particularly individuals with disabilities.

While this report offers a useful overview that may also be of value to a broader audience, it is primarily intended as an information resource for the project members, providing insights on user needs and outlining key requirements and constraints to inform the technical work packages.

1.2 Definition of inclusion and accessibility by design

In MuseIT, ***inclusion*** is understood as a commitment to non-discrimination and the promotion of equal opportunities for all individuals, regardless of (dis)ability, ethnicity, gender identity, age, background, economic and social status, or specific needs. We embrace a vision of societies where diversity is celebrated, barriers are eliminated, and everyone has access to opportunities and resources that empower them to thrive. With affinity to the concept of *Inclusive Design*[1], for us ***inclusion by design*** refers to the intentional creation of systems, environments, and interactions that accommodate the diverse needs of all users, regardless of their abilities. ***Accessibility by design*** focuses specifically on removing barriers that might impede individuals with disabilities from accessing digital content, tools, or services. These principles are rooted in frameworks such as *Universal Design*[2], and *Inclusive Design*[3], which prioritise equitable usability and participation (also see[4,5,6,7]).

1.3 Participatory design

According to Sanders (2008)[8], many different approaches are being explored within design research, which, regardless of being competing or complementary, "*share a common goal: to drive, inspire, and inform the design development process.*" She presents a framework that maps these approaches along two intersecting dimensions: mindset and approach. The *mindset* dimension ranges from an expert mindset, where designers act as specialists crafting solutions for people, to a participatory mindset, which involves collaboration with people as co-creators in the design process. The *approach*

[1] https://www.inclusivedesigntoolkit.com/whatis/whatis.html
[2] https://universaldesign.ie/about-universal-design
[3] Persson, Hans, åhman, Henrik, Yngling, Alexander Arvei, & Gulliksen, Jan. (2015). Universal design, inclusive design, accessible design, design for all: different concepts—one goal? On the concept of accessibility—historical, methodological and philosophical aspects. *Universal Access in the Information Society*, *14*(4), 505-526. doi:10.1007/s10209-014-0358-z
[4] Khalil, M. E., Mohamed, N. A., & Morghany, E. A. (2021). Towards inclusion and diversity in the light of Universal Design: three administrative buildings in Aswan city as case studies. *Journal of engineering and applied science (Online)*, *68*(1), 1-28. doi:10.1186/s44147-021-00020-0
[5] https://en.wikipedia.org/wiki/Inclusive_design
[6] https://en.wikipedia.org/wiki/Universal_design
[7] https://link.springer.com/article/10.1007/s10209-014-0358-z
[8] https://www.dubberly.com/wp-content/uploads/2008/11/ddo_article_evolvingmap.pdf

dimension spans from design-led practices, which are driven by creative exploration and making, to research-led practices, which are guided by systematic inquiry and analysis (see Figure 1).

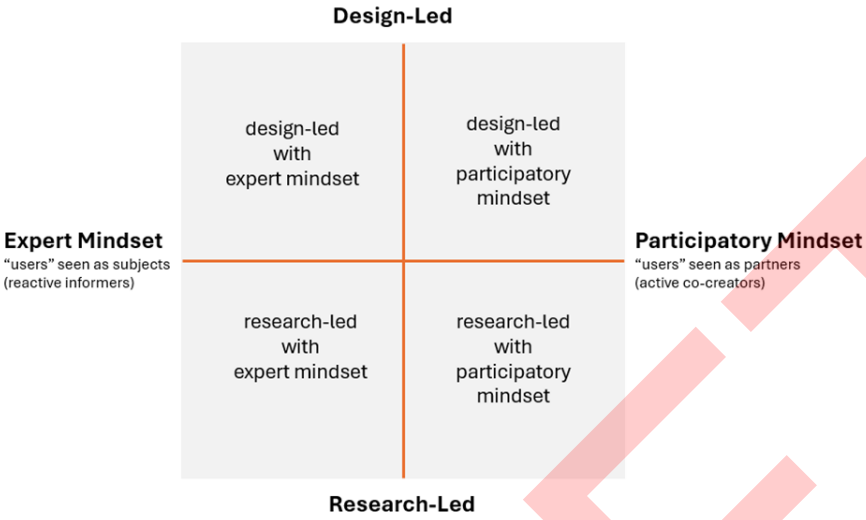

Figure 1: Map of design research - underlying dimensions (diagram reproduced based on the original by Sanders, 2008:2)

Sanders situates participatory design within the participatory mindset and notes that it can be either design-led or research-led depending on the context. Participatory design emphasises collaboration, inviting the intended users of a product or service to become active contributors to the design process. By drawing on their lived experiences, knowledge, and perspectives, participatory design promotes co-creation, enabling the development of more meaningful and user-centred solutions.

1.4 Relevance of inclusive and accessible digital interactions for the project and for the Creative and Cultural Industries (CCI)

MuseIT, by its nature, is intended to promote inclusion and broaden access to cultural assets and engagements. Therefore, accessibility and equitable participation are central in all aspects of the project, valuing diversity and engagement in cultural experiences for all. Accordingly, a user-centred participatory approach is adopted where we have actively aimed to involve those who will potentially be served by the developments in the project. In our work we value the participants representing our target groups as co-creators and aim to ensure to meet their needs.

The CCI sector is key in cultural engagement and preserving heritage. However, traditional approaches have often overlooked the needs of individuals with disabilities. By prioritising inclusive digital design, the CCI sector has the potential to unlock cultural engagement for previously excluded groups, enabling richer and more diverse cultural engagements. This will not only enhance accessibility but also will enable broader participation of those typically excluded in shaping cultural narratives. Inclusive digital design also supports the sustainability of cultural institutions by expanding their reach to audiences of all abilities, enhancing their relevance in an increasingly digital society. Moreover, by setting standards for equitable access and participation, and by enabling broader audience engagement, adoption of inclusive design will strengthen the key role of the CCI sector, enriching the sector's societal impact.

2. Key frameworks

Universal design in cultural institutions aims to create inclusive experiences accessible to people of all abilities. Seven principles of universal design[9] are adapted specifically for cultural spaces (Larsson, 2023)[10].These principles emphasize ***equitable use***, where designs are created to be appealing and functional for everyone, regardless of their physical or cognitive abilities. ***Flexibility in use*** highlights the importance of accommodating diverse preferences and needs, allowing individuals to interact with spaces or systems in ways that suit them best. ***Simplicity and intuitive use*** focus on ensuring that environments and designs are straightforward and easy to navigate, regardless of a user's experience or familiarity. Effective communication is also central to universal design. This principle, referred to as ***perceptible information***, emphasises the need for conveying critical details in ways that are accessible to all, even in the presence of sensory limitations or challenging environmental conditions. Designs also incorporate ***tolerance for error***, which minimises risks and reduces the negative impact of mistakes, allowing for safe and forgiving interactions. Physical accessibility is another key focus, with the principle of ***low physical effort*** advocating for designs that require minimal exertion to use efficiently and comfortably. Lastly, ***size and space for approach and use*** ensure that environments are inclusive of diverse body types, mobility levels, and postures, offering ample room for all individuals to interact with the space effectively.

The universal design principles can be implemented in a variety of cultural institutions: libraries, museums, and galleries, theatres and concert halls, cultural heritage sites and tourist attractions. Many of the earlier presented examples use these principles creating multi-sensory exhibition designs incorporating touch, sound, and visual elements; applying digital technologies to enhance accessibility including virtual and enhanced reality; presenting interactive designs adaptable to different users or alternative formats for presentation of information and artefacts.
In digital cultural spaces the online platforms use adaptive interfaces, accessible virtual tours, multiple access points to digital collections, audio descriptions and captioning. Many strive to make them compatible with screen readers.

Educational programmes of cultural institutions provide staff with increased accessibility awareness, adaptive tools and materials, multimodal learning approaches. This helps in creating inclusive programming for diverse audiences.

In general, ***universal design*** seeks to create one solution that works for everyone by focusing on creating products, environments, and services usable by all people without adaptation, taking a "one-size-fits-all" approach, emphasising accessibility from the start of the design process, using its seven principles. This is not always enough, and ***inclusive design*** complements it by actively involving users in the design process to ensure that their unique perspectives and lived experiences directly shape the outcome. It also emphasises

- The need to recognise human diversity,
- Focusing on traditionally excluded user groups,
- Involving target users directly in the design process,
- Emphasising personalisation and adaptability,
- Creating multiple solutions to accommodate different needs.

[9] https://universaldesign.ie/about-universal-design/the-7-principles
[10] Larsson, K. (2023). *Aiming for Universal Design*. Paper presented at the 88th IFLA World Library and Information Congress (WLIC), Rotterdam, The Netherlands. Retrieved from https://repository.ifla.org/handle/123456789/2670

Both approaches consider diversity of human abilities, aim to create accessible solutions, promote equity and emphasise proactive design. The main distinction is that universal design aims to create that works for everyone, while inclusive design addresses the gaps that universal design alone might not fill, e.g., if needed creating multiple solutions to accommodate different needs and preferences[11].

3. Review of Existing Inclusion and Accessibility Design Methodologies

3.1 Current Practices in CCI

Many cultural and creative institutions are well aware of the issues of inclusion and use a number of ways to diminish digital inequality, though many of them are affected by a number of difficulties to implement the required practices. Jane Mackey (2021)[12] has reported on different types of barriers to digital inclusion in the art and culture sector: individual, organisational, community and sectoral/societal. As digital inequality manifests itself in physical and economic access to technologies and content, skills and competencies, possibility to derive value and most of all in motivation to use (Van Dijk, 2020)[13]. There are attempts by the CCI to reduce these barriers and increase actual inclusion using universal designs and specific methods addressing either the needs of all or of a very particular audience. Research shows that digital inequality is closely linked with the physical, social, and economic context of people (Yates et al., 2020)[14]. However, apart from abilities and demographic features the exclusion runs on a continuum: those who 1) use only social and entertainment media, 2) use a narrow variety of social media, 3) do not use social or entertainment media, just some internet websites, and 4) do not use digital media or communication.

The COVID-19 pandemic stimulated many arts and cultural institutions to start using digital platforms and methods to communicate their products and services for the first time. However, this has not addressed the accessibility and sometimes even proper access issues in most of the cases. On the other hand, some of the cultural institutions and organisations have worked with inclusion and accessibility in physical environments and have paid attention to the needs of people with various disabilities. They have transferred these concerns and experiences to the digital environment. We will use a mix of the digital inequality features identified by van Dijk (2020) and Mackey's barriers (2021) to present the solutions for practical implementation of digital inclusion in the CCI sector as it is presented in research and best practice literature.

3.2 Access and accessibility to cultural services and digital technologies in libraries.

Access to digital technologies is a crucial condition for using any digital services or content in all cultural and memory institutions, including libraries. The institutions providing public access to computers, internet connection and even commercial digital databases free of charge to the users are libraries, and public libraries in the first place. Access does not automatically mean accessibility. Libraries need to make extra effort to ensure that library services can be used by and are relevant for

[11] Persson, H., Åhman, H., Yngling, A.A. *et al.* (2015). Universal design, inclusive design, accessible design, design for all: different concepts—one goal? On the concept of accessibility—historical, methodological and philosophical aspects. *Universal Access in the Information Society, 14*(4), 505–526. https://doi.org/10.1007/s10209-014-0358-z

[12] Mackey, J. (2021). *Digital inclusion and exclusion in the arts and culture sector*. Good Things Foundation. https://www.artscouncil.org.uk/sites/default/files/download-file/Good_Things_Foundation_Arts_Council_Report.pdf

[13] van Dijk, J. (2020). *The digital divide*. Polity Press.

[14] Yates, S. J., Carmi, E., Lockley, E., Pawluczuk, A., French, T., & Vincent, S. (2020). Who are the limited users of digital systems and media? An examination of U.K. evidence. *First Monday*, *25*(7). https://doi.org/10.5210/fm.v25i7.10847

everyone, regardless of their abilities, educational level, age, social or economic status. Thus, most modern libraries have or at least make an effort to provide spaces for wheelchair navigation, adaptable furniture and lighting, clear signposting in visible and tactile signs, sensory relaxation zones, lifts, suitably equipped toilets and rooms. Easy access to locations of libraries and other cultural institutions by public transport is one of the accessibility conditions. In addition, libraries seek to provide all kinds of content, with which their users can identify, formats for use by different people, and competent staff members capable of communicating in languages used by their visitors and understanding their needs.

Oodi Public Library in Helsinki[15] (Finland) is an example of an inclusive library: there robots deliver books to readers living with disability, tactile floor helps visitors with visual impairments to orient in the space, sensory zones help relaxation and protect from aural and visual overstimulation, all tables are regulated to accommodate different heights. It attracts 75% more visitors with disabilities than before this transformation.

Gabriel Garcia Márquez Library,[16] in Barcelona, offers virtual library tours and virtual reality travelling for people with mobility impairments, 3D printers for accessible equipment, literature readings on telephone and book delivery at home for people with disabilities and seniors. Library accommodates over 5000 virtual visits to the library monthly.

3.3 Accessibility to websites and digital cultural resources in museums

In 2024, Kinaole, a company specialising in digital accessibility, inclusive design and implementing accessible solutions in real life, has published "Digital accessibility report of European museums" (Dąbrowski et al., 2024)[17]. It includes the analysis of 17 museums' websites regarding compliance with the European directives (The Web Accessibility Directive[18], The European Accessibility Act[19], and the GDPR[20]). In their analysis the team of assessors, including some with visual impairments, have checked to see if the analysed websites meet selected Web Content Accessibility Guidelines (WCAG), and accordingly scored. For this, the accessibility scores were calculated as a percentage, based on points earned out of a maximum possible score, with deductions made for errors. The assessors have outlined the current state of the accessibility features, but have not conducted a comprehensive analysis of the accessibility. Even so, only some museums had high scores with British museums scoring highest: The National Gallery - 93,33%; British Museum - 78,13%; The National Museum of Scotland - 73,33%; The Uffizi Gallery (Italy) - 68,80%; The Rijksmuseum (Netherlands) - 60,00%. The rest were rather lacking in accessibility and inclusive design, though all have attempted to meet the requirements, and some have been quite accommodating for assessors with visual impairments. The authors of the report have identified the main barriers to the accessibility of each museum and provide recommendations for improvement.

This report, however, shows the gap between the aims, policy documents and the reality in reaching true inclusion in the cultural sector.

[15] https://oodihelsinki.fi/en/
[16] https://ajuntament.barcelona.cat/biblioteques/en/bibgarciamarquez
[17] Dąbrowski, A., Filipowska, B., Jurczyk, M., Stochurski, R., Szymczak, M., Tumidajewicz, A., Zrolka, P. (2024). *Digital accessibility report of European museums.* Kinaole
[18] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=LEGISSUM%3A4314916
[19]https://employment-social-affairs.ec.europa.eu/policies-and-activities/social-protection-social-inclusion/persons-disabilities/union-equality-strategy-rights-persons-disabilities-2021-2030/european-accessibility-act_en
[20] https://gdpr.eu/what-is-gdpr/

Matos Silva and Simao (2024)[21] have conducted a study to investigate whether the digital adaptation, resulting from the technological innovation implemented, allows better performance in terms of information accessibility/virtual accessibility on the virtual visit web pages or on those that inform and publicise the respective museums. They have found that: "*websites with the best degree of accessibility for face-to-face visitors are those of the Louvre Museum and the Museo Nacional del Prado, with an accessibility index of 9.7*[22]*. However, only the Louvre maintains the same performance on the virtual page, while the Prado significantly lowers the level of accessibility on the opening page of the virtual tour to 7.4. Some of the websites of the museums analysed are manifestly deficient as we verified, with low values in terms of performance when analysing their virtual accessibility*" (Matos Silva and Simao, 2024, p. 7).

The number of positive examples is growing. The website of National Gallery is not only accessible, but also provides a webpage on the accessibility features of their website[23] and invites users to contact it if they come across barriers to accessing information. The British Museum informs about accessibility features in the museum, though this information only deals with physical access[24].

The British Museum offers online galleries[25] providing a variety of tools to explore the cultural heritage items, such as virtual tours, collection stories, detailed exhibits' data, possibilities to enlarge images and view them from various perspectives.

The Louvre[26] and Museo Nacional del Prado[27] virtual tours provide multiple access to the paintings and the stories behind them, though lack full scale accessibility, e.g. multiple language access, help in navigating, or providing navigation and information clues.

A highly acclaimed multisensory exhibition[28] was held at the Visconti Castle of Pavia (Italy) in 2015. It presented gesture and gaze-based interaction with digital representations of tapestries of the Battle of Pavia, and allowed visitors to interact with tactile representations, 3D objects and virtual avatars from the tapestry images. Though using digital technology, it took place in physical spaces (Cantoni et al., 2024)[29]. Since then, multisensory exhibitions have become popular all over the world and a list of them is provided in Emotions Market[30]. These exhibitions apply different approaches to multisensory representations involving visual, aural, tactile, olfactory, kinetic, and other senses. They present musical and storytelling, tactile installations and even pillow fights as representations of art objects. One of them, Philippe Parreno at Leeum Museum of Art, Seoul has also involved data sequencing, Digital Multiplex (DMX), and artificial intelligence to create a synesthetic experience, expanding the ways of experiencing art. To some extent it is represented in a video on YouTube[31]

[21] Matos Silva, F. and Simão, E. (2024). Digital accessibility in art museum webpages and virtual tours. EasyChair Preprint no. 14736. https://easychair.org/publications/preprint/S4dB/open

[22] It is reported that AccessMonitor Plus has been used, but more specification of what these scores specifically refer to is not provided. From the report, it seems that the scores range from 7.1 to 9.7.

[23] https://www.nationalgallery.org.uk/accessibility

[24] https://www.britishmuseum.org/visit/accessibility-museum#accessible-resources

[25]https://www.britishmuseum.org/collection/galleries#:~:text=Explore%20more%20than%2060%20galleries,timelines%2C%20family%20activities%20and%20facts.

[26] https://www.louvre.fr/en/online-tours#virtual-tours

[27] https://www.museodelprado.es/en/virtual-tours

[28] "1525–2015. Pavia, la Battaglia, il Futuro. Niente fu come prima" / "1525-2015. Pavia, the Battle, the Future. Nothing was the same again"

[29] Cantoni, V., Dondi, P., Lombardi, L., Nugrahaningsih, N., Porta, M., Setti, A. (2018). A Multi-sensory approach to cultural heritage: *The Battle of Pavia* exhibition. *IOP Conference Series: Material Science and Engineering*, 364, 012039. oi:10.1088/1757-899X/364/1/012039

[30] https://emotions.market/blog/multisensory-art-exhibitions-from-around-the-world-2024/

[31] https://www.youtube.com/watch?v=lAktXgy130g

and Esther Schipper online gallery[32]. However, none of these exhibitions have been designed as an online event.

3.4 Portals to museums

Portals to museums and other cultural institutions create opportunities for many people to access and use art or cultural heritage connections from home, thus catering for those who lack mobility, resources for travel or other opportunities. Not all of them are accessible for everyone so far, but the work on developing accessibility features is going on.

One of the main European portals to 4000 European cultural and memory institutions is Europeana launched in 2008. It conducts the accessibility assessments itself and so far, has not scored high on them[33]. However, it has a good representation of its portal in different European languages and will have to fully comply with the European Accessibility Act by June 2025.

Google Arts and Culture provides access to a number of museums and art collections that can be accessed from home. Most of these resources are accessible and some items can be viewed as 3D images from different angles, though much depends on the institution cooperating with Google. E.g., the University of Edinburgh's website[34] is designed with accessibility in mind, offering users the ability to *customise* their experience through browser settings by adjusting *colours*, *contrast levels*, and *fonts*. Users can navigate the entire website using just a *keyboard* and access most areas using *speech recognition* software. The site is also compatible with popular *screen readers* such as JAWS, NVDA, and VoiceOver, ensuring that most of its content can be listened to. Additionally, the website imposes *no time limits* and *avoids* the use of *flashing*, *scrolling*, or *moving text*, providing a stable and user-friendly browsing experience.

There are also private initiatives serving the GLAM[35] sector and providing opportunities to have an accessible presence on the internet. One of those employing AI systems for curating digital objects is Atopia[36], which offers AI for "curating the collection of digital art within a 3D museum, the AI curator allows art lovers to discover new, unexpected connections between different works. This opens up space for a deeper engagement with art that goes beyond the conventional understanding of exhibitions.[37] This approach redefines 3D museum experience for a broad audience and provides a new tool in reaching them to curators. At present four German and Austrian art and museum institutions provide 3D internet and virtual reality access to their exhibitions.

One of the international regional initiatives is Balkan Museum Access Group (belongs to Balkan Museum Network) that hosts a site of accessibility information about museums[38], art galleries and archaeological sites in ten countries. Some of these institutions include links to their accessible websites, virtual tours and accessible apps.

[32] https://www.estherschipper.com/exhibitions/1293-voices-philippe-parreno/
[33] https://www.europeana.eu/en/rights/accessibility-policy
[34] https://www.ed.ac.uk/about/website/accessibility/statement
[35] Galleries, Libraries, Archives, and Museums
[36] https://atopia.space
[37] https://atopia.space/blog/ai-curator-experience-digital-art-in-the-3d-museum-anew
[38] https://accessible.bmuseums.net/

3.5 Accessible digital resources of other culture and art institutions

Other cultural institutions, such as theatres, concert halls, or other performing arts also provide accessible digital resources, which gained popularity during Covid-19 pandemic, but acquired accessibility features later. Most of them provide similar possibilities as museum online or virtual reality tours, but also some special additional features. This includes customisable text size and contrast settings, keyboard-only navigation options, screen reader compatibility, closed captions and transcripts, multiple language options, pause and rewind capabilities, flexible viewing time frames to accommodate different needs. One of such virtual performance venues is the National Theatre at Home (UK). It offers captioned and audio-described recordings of their productions, with keyboard navigation support and screen reader compatibility. They provide recordings of plays like "Frankenstein", "A Midsummer Night's Dream", and “Coriolanus” for their subscribers either for free or for a fee[39].

Apart from theatre some concerts are also accessible online. For example, Berlin Philharmonic Digital Concert Hall ensures their platform works with screen readers and provides multimedia transcripts. The content is also accessible for a moderate annual or monthly fee.[40]

4. Arts for People with Disability

In addition to cultural institutions that strive for accessibility and inclusion, and a multitude of projects that aim to broaden access to cultural heritage in different ways, there are also many organisations and online resources that support artists and arts audiences who live with disability. These institutions are making great strides in ensuring that art is accessible to everyone. This section provides some examples from the countries represented in the MuseIT consortium, as a resource for project members towards exploring opportunities for potential collaborations. Connection with some of these organisations has been made and some concrete collaborations (e.g., representation in the project’s advisory board, organisations of joint events, etc) have been achieved. There are also other organisations with similar ambitions in other countries (beyond the MuseIT consortium) with which we have established contact and collaborations. Those are not included in this report.

Sweden - ***The Swedish Arts Council (Kulturrådet)***[41] is the governmental agency with sectoral authority for availability, with a special remit to further the development and to make cultural life accessible for people with disabilities. The basis for this remit is the national cultural policy objectives, decided by the Swedish parliament which state: “*Culture is to be a dynamic, challenging and independent force based on the freedom of expression. Everyone is to have the opportunity to participate in cultural life. Creativity, diversity and artistic quality are to be integral parts of society’s development.*” The council fulfils the cultural policy objectives through its grants and other operations. The grants are intended to support organisations, working professionally with art and culture, both in Sweden and internationally, where typically, each year, around SEK 2.5 billion is allocated to:

- Literature, libraries and promoting reading
- Visual Arts, craft, design and museums
- Music, theatre, dance, and modern circus
- Creative Schools and the Cultural Schools

[39] https://www.ntathome.com/
[40] https://www.digitalconcerthall.com/en
[41] https://www.kulturradet.se/en/

Share Music and Performing Arts [42], a beneficiary in the MuseIT Project, SHMU is a knowledge centre that aims to promote:

- The right of everyone to participate in, experience and practice cultural and artistic activities
- Reaching out across sectors and at all levels of the cultural ecosystem
- Generating, utilising and collecting knowledge in a knowledge base
- Increased sharing and dissemination of knowledge on inclusive approaches and practices
- Development of the arts through greater inclusion

SHMU aims to achieve:

- More practitioners, authors and artistic leaders with disabilities in Swedish and international cultural life for the enrichment of the arts and society
- A new cultural landscape with new expressions and narratives by disabled practitioners
- The perspective of disability rights being as natural as, for example, ethnic diversity, gender equality and other grounds of discrimination in the entire cultural ecosystem
- Increased knowledge of inclusive practices across the cultural ecosystem
- A richer and more equal cultural life in Sweden — and the world — that reflects the diversity and richness of society

The Swedish Agency for Participation (Myndigheten för delaktighet - MFD)[43], is an expert governmental agency that promotes work with the implementation of disability policy towards a society in which everyone can participate on equal terms. ***Kulturcentrum Skåne***[44], is a regional center for music, theater and art that caters to people with cognitive functional disabilities. ***Kulturlabbet***[45], is a daily work activity centre for visual, performing and textual artists with cognitive disabilities. ***Moomsteatern***[46] is a professional inclusive theatre company in Malmö, with which the project partner SHMU has established collaborations. Here, actors with learning-disabilities are employed on a full-time basis, on stage most often integrated with non-disabled freelance actors. ***Skånes Dansteater***[47], is a contemporary dance repertory ensemble presenting works by Swedish and international choreographers, contributing to the development of dance as an art form. Among others, it also develops and spreads information about obstacles to participation and supports public-sector bodies. ***Danskompaniet Spinn***[48], is a professional dance company that emphasises inclusivity by featuring dancers with and without disabilities, aiming to challenge norms, stereotypes regarding what dance is and can be, and broadening perspectives within the dance community. ***Riksteatern Crea***[49] is Sweden's national platform for deaf theatre, producing performances in Swedish Sign Language and working to make theatre accessible to deaf and hard-of-hearing audiences. On a regional and municipal level, different agencies are responsible for accessibility policies, including in culture. In Gothenburg, for example, the ***Eldorado Resurscenter*** works with cultural activities for people with severe cognitive impairments.

Cyprus - ***Beyond DisDance Inclusive Dance Festival***[50], is an annual performing arts festival dedicated to promoting local as well as international inclusive and accessible performance works, aiming to provide a platform for performers with disabilities and supporting diversity in the performing arts. ***CARTA (Cyprus Art Therapy Association)***[51], is a nonprofit organisation that

[42] https://www.sharemusic.se/
[43] https://www.mfd.se/other-languages/
[44] https://www.kulturcentrumskane.se/om-oss/
[45] https://raddningsmissionen.se/kulturlabbet
[46] https://moomsteatern.com/
[47] https://www.skanesdansteater.se/
[48] https://danskompanietspinn.se/en/
[49] https://www.riksteatern.se/riksteatern-crea/
[50] https://www.synergeio.org/beyond-disdance-inclusive-dance-festival
[51] https://www.carta-ngo.org/

promotes art therapy as a means of communication and emotional management, offering workshops and activities to facilitate creative expression for individuals, including those with disabilities. ***European Art and Culture Disability Festival***[52], is an Art and Culture Disability Festival in Larnaka city, which promotes the inclusion of people with disabilities and the value of diversity through numerous events and activities. Their programme includes visual exhibitions, musical performances, academic announcements, art and educational workshops. These events aim to inspire and reinforce cultural dialogue, promoting collaboration among artists with and without disabilities from across Europe. ***Pancyprian Organization for the Rehabilitation of Disabled People (PORDP)***[53], aims to impact the social and political inaction and promote the philanthropic face of society, by producing work and offering support to citizens who need it the most with focus on people with disability. It provides information services, psychosocial and psychological support services as well as independent living services and experiential children's workshops, rich cultural and cultural events, etc. all free of charge.

Greece - ***Artogether***[54], is a nonprofit organisation that encourages the participation of people with disabilities in cultural events and artistic expression. They offer weekly workshops in theatre, music, dance, and visual arts, organise exhibitions, train artists, and conduct research on accessibility in cultural venues. ***Onassis Stegi***[55], is a cultural institution in Greece, offering dance and disability programs, participating in international partnerships to promote inclusive dance, and developing participatory programs for disabled aspiring dance artists. The theatre group, ***THEAMA – Theatre for the Disabled***[56], is a professional theatre ensemble mainly composed of disabled artists, established based in Athens. It applies an inclusive concept so actors/performers with no disability are also part of the ensemble, and it operates a Drama Workshop for all aspiring to establish the first of its kind Drama Academy within an inclusive framework for disabled and non-disabled artists. ***National Confederation of Disabled People (NCDP)***[57], is an umbrella organisation representing the disability movement in Greece. NCDP's mission includes combating discrimination against disabled people and promoting their rights, including access to cultural and artistic activities. ***Greek Network of Service Providers for Persons with Disabilities (The NET)***[58] is a collective umbrella organisation representing service providers for people with disabilities across Greece. The NET aims to improve services that enhance the quality of life for persons with disabilities, including access to cultural and artistic opportunities. ***OFF Stream***[59] is a private small company in Thessaloniki, northern Greece, which offers designs of museum collections based on the principles of inclusion and Universal Design.

Belgium - ***Belgian Disability Forum (BDF)***[60] is an umbrella organisation representing persons with disabilities in Belgium, and advocates for the rights and inclusion of disabled individuals across various sectors, including the arts. They collaborate with European institutions to promote cultural accessibility. ***Brussels for all***[61] is an initiative that provides information on mobility assistance for tourists, including accessible cultural venues such as museums and theatres. They offer a free trilingual guide to enhance the cultural experience for individuals with disabilities. ***Horizon 2000***[62]

[52] https://larnakaregion.com/event-detail/-european-art-and-culture-disability-festival
[53] https://www.cyprusalive.com/en/pancyprian-organization-for-the-rehabilitation-of-disabled-people-pordp
[54] www.vsahellas.gr
[55] https://www.onassis.org/onassis-stegi
[56] https://theamatheater.gr/en/home-eng/
[57] https://www.esamea.gr/el
[58] https://todiktyo.org/en/
[59] https://offstream.org/
[60] https://bdf.belgium.be/en/
[61] https://be.brussels/en/leisure-events-sports/brussels-all-0
[62] https://www.h2000.be/

is an information and education service promoting the integration of disabled people in Belgium, including through cultural and artistic initiatives.

The Netherlands - ***My Breath My Music***[63] is a nonprofit foundation dedicated to providing access to music-making for individuals with severe physical disabilities. We have established a collaboration with this group with a few of the members participating in a symposium organised by the MuseIT project. The organisation focuses on the development and distribution of custom-made musical instruments and assistive technology, such as the Magic Flute, which allows people to play music using only their breath and head movements. They also organise workshops, concerts, and training sessions to promote inclusivity in music education and performance. Their work is recognised for empowering individuals with disabilities to explore their musical potential and participate actively in creative expression. With headquarters in the Netherlands, ***Europeana***[64] is a digital platform for cultural heritage, with which the MuseIT project has established close connections. It champions accessibility and inclusivity in the arts. By making millions of cultural items available online, Europeana ensures that people of all abilities can explore, learn, and engage with Europe's rich heritage. They also work with cultural institutions to develop tools and strategies that make digital collections more inclusive for users with disabilities. ***Holland Dance Festival***[65] is a dance organisation that has been a national pioneer in artist development, offering opportunities for disabled artists to work at a professional level. Through its DanceAble program[66], it promotes inclusivity in dance and has hosted major conferences on dance and disability. ***Misiconi Dance Company***[67], where the dancers are a mixed company of people with and without disabilities, works inclusively on a structural basis and provides weekly community classes, workshops, talent development programs, and professional company work, fostering an inclusive dance practice. ***Jostiband Orchestra***[68] is an orchestra for individuals with developmental disabilities. With over 120 members, they perform regularly in the Netherlands and internationally, showcasing the musical talents of individuals with disability. Stichting het Gehandicapte Kind (Dutch Foundation for Disabled Children)[69] is a foundation that promotes and financially supports initiatives aimed at the participation and integration of individuals with disabilities up to the age of 30 in Dutch society. Their efforts include supporting accessible playgrounds, schools, and sports facilities.

France - ***IRCAM (Institut de Recherche et Coordination Acoustique/Musique***)[70], is one of the world's leading institutions for avant-garde music and sound research. MuseIT has the privilege of close collaboration with IRCAM, both in conducting research and also organising a joint event. While its primary focus is not exclusively on disability, IRCAM has pioneered projects that enhance accessibility in music creation and performance. For instance, they develop assistive technologies and adaptive instruments that enable people with disabilities to engage in music composition and performance. Their initiatives support inclusivity by allowing individuals with diverse abilities to participate in contemporary music and sound art. With headquartered in France ***International Music Council (IMC)***[71] is a global network of organisations and individuals dedicated to promoting access to music for all. The IMC advocates for the development of musical diversity, education, and inclusion. Its Five Music Rights framework emphasises the importance of accessibility, especially for marginalised and disabled communities, ensuring that everyone has the opportunity to express

[63] https://mybreathmymusic.com/en/
[64] https://www.europeana.eu/en
[65] https://www.holland-dance.com/en/
[66] https://www.holland-dance.com/en/performances/danceable-symposium
[67] https://www.stimuleringsfonds.nl/en/projects/designing-for-inclusive-dance-education
[68] https://jostiband.nl/en/about-the-jostiband/
[69] https://gehandicaptekind.nl/
[70] https://www.ircam.fr/lircam
[71] https://imc-cim.org/

themselves and participate in music-making. Based on our shared interest, we are very happy to have established connections and the support of IMC for our MuseIT project. ***La Bulle Bleue***[72], is an ESAT (Etablissement et Service d'Aide par le Travail) artistic structure. It combines social support with professional development by offering workshops, artist residencies, and theatrical performances for individuals with disabilities. It promotes inclusivity by integrating disabled artists into the theatre world. ***Théâtre du Cristal***[73], is a theatre company which also collaborates with an ESAT to integrate disabled artists into performing arts. It has produced inclusive works and is a key organiser of Festival Imago[74], a renowned event dedicated to inclusive creations. ***Fondation de France***[75] supports initiatives under its "Arts and Society" program to make arts and culture accessible to everyone, including individuals with disabilities. It funds diverse projects like cultural mediation programs and provides support for young disabled artists in multiple disciplines. ***Festival Clin d'Oeil***[76] is a biennial performing arts festival focused on French Sign Language and Deaf culture. The event celebrates inclusivity by showcasing theater, dance, cinema, and visual arts created by Deaf artists, encouraging collaboration and understanding between communities.
Additionally, several cultural organizations, including many of the ones mentioned, have gathered under the ***Réseau Accès Culture***[77] to work together in advocating for accessibility, sharing best practices, and fostering inclusion within the cultural sector. This network strengthens collective efforts to ensure cultural spaces are open and welcoming to everyone and has expressed its interest for MuseIT. Finally through the project partner MCA connections have been made with many organisations that advocate inclusion, making their collections accessible to people with disability. Examples include, ***Le Cnam*** (Conservatoire National des Arts et Métiers)[78], which actively integrates accessibility into its cultural and educational initiatives; ***Musée du Quai Branly – Jacques Chirac***[79], dedicated to making its spaces and collections accessible to all; ***Bibracte***[80], an archaeological museum and research center, prioritising accessibility by offering inclusive tours and workshops; and ***Pearle***[81] (Performing Arts Employers Associations League Europe), which advocates for the inclusion of people with disabilities across the performing arts sector in Europe.

Italy - ***Teatro Stabile di Torino***[82] is one of Italy's prominent theaters and while not exclusively focused on disability arts, it has implemented initiatives to promote accessibility and inclusivity. The members of the theatre have shared their experiences and some of the insights gained in their work towards inclusion with the MuseIT project. The theatre offers performances with accessibility services such as audio descriptions, sign language interpretation, and subtitles to make theatre experiences available to audiences with disabilities. ***Oriente Occidente***[83], actively works to strengthen the role of contemporary dance in Italy and is a core partner of the Europe Beyond Access program, focusing on the professionalisation of disabled artists in the performing arts. ***Teatro La Ribalta – Accademia Arte della Diversità***[84], is a theatre company that aims to give a new perspective, a new project and a more solid future, a long-standing experience of 'Art of Diversity Academy' project, and is recognised as Italy's first professional theatre company comprising actors with

[72] https://www.labullebleue.fr/
[73] https://www.theatreducristal.com/
[74] https://www.theatreducristal.com/festival-imago/
[75] https://www.fondationdefrance.org/fr/
[76] https://www.clin-doeil.eu/en/
[77] https://accesculture.org/
[78] https://www.cnam.fr/portail/conservatoire-national-des-arts-et-metiers-accueil-821166.kjsp
[79] https://www.quaibranly.fr/fr/
[80] https://www.bibracte.fr/en/bibracte-museum
[81] https://www.pearle.eu/
[82] https://www.teatrostabiletorino.it/
[83] https://www.orienteoccidente.it/en
[84] https://www.teatrolaribalta.it/

disabilities. It aims to challenge societal perceptions and promote inclusivity through its productions. ***Laboratorio Teatrale Integrato Piero Gabrielli***[85] is an integrated theatre laboratory which offers workshops and training courses for young disabled and non-disabled individuals. It promotes social inclusion and participation through the practice of theatre and emphasises inclusive theatrical practices. ***Danzabile***[86] is an online network that connects artists, trainers, companies, and schools working in the context of inclusion and diversity in Italy. It was born out of Oriente Occidente's involvement in the Moving Beyond Inclusion project and aims at the professionalisation of the artists, with the ambition to present high - quality performances, which could take place in both Italian and international events of contemporary dance. Festival del Silenzio[87] is a festival that offers theatre, dance, visual art, and music with the aim of being accessible to people who use either signed or spoken languages, often featuring performances by sign-language users and other forms of visual communication.

UK - ***Sense UK***[88], (with members represented in the MuseIT Project Advisory Board) is a national charity that supports people who are deafblind or have complex disabilities. Their arts programs include workshops, dance, music, and visual arts, aiming to empower individuals to express themselves creatively. Sense also organises community arts projects and supports artists with disabilities. They provide fully accessible environments and use technology to help participants develop their skills. Similarly, with Sense UK as its parent organisation, ***Sense International***[89] engages with similar initiatives in an international context. ***Drake Music***[90] is a pioneering organisation that uses technology to make music-making accessible for people with disabilities. They work at the intersection of music, disability, and technology, creating opportunities for disabled people to engage in music education, composition, and performance. Members of MuseIT have established stimulating and valuable connections with Drake music. ***Disability Arts Online (DAO)***[91] is a charitable arts organisation led by disabled people that with its website and other resources, showcases disability arts content, artist development programmes, partnership and consultancy work, accessible events. Even Disability Arts International is UK based website, developed and coordinated by the British Council for cultural relations and educational opportunities[92]. Another UK-based organisation is ***Shape Arts***[93], which is a disability-led arts organisation that works to improve access to culture for disabled people. It aims to achieve its mission by providing opportunities for disabled creatives, training cultural institutions to be more open to disabled people, and through running participatory arts and development programmes.

USA - ***Disabled Artists Foundation, Inc, dAFi***[94], aims to provide voice to differently abled artists and enables sharing art experiences and ideas together. ***California Arts & Disability Resource Centre***[95] among others aims to strengthen the capacity of the mainstream arts community to include artists and audiences with disabilities, and promote the professional development of artists with disabilities through access to educational, vocational and community activities, support and networks. ***Access Gallery***[96], engages the community by opening doors to creative, educational and

[85] https://www.teatrodiroma.net/laboratorio-gabrielli/
[86] https://danzabile.provincia.tn.it/eng
[87] https://www.fattoriavittadini.it/festival-del-silenzio/
[88] https://www.sense.org.uk/our-services/arts-sports-for-disabled-people/art-for-disabled-people/
[89] https://www.senseinternational.org.uk/who-we-are/about-sense-international/
[90] https://www.drakemusic.org/
[91] https://disabilityarts.online/
[92] https://www.disabilityartsinternational.org/about-us/
[93] https://www.shapearts.org.uk/Listing/Category/about-shape
[94] https://www.disabledartists.org/
[95] https://www.semel.ucla.edu/cadrc/about
[96] https://www.accessgallery.org/

economic opportunities for people with disabilities to access, experience and benefit from the arts. It provides a professional gallery space, an inclusive studio where the artists can explore and build their skill sets, and a wide range of services such as graphic design, murals, corporate art commissions and more. ***The ArtThread Foundation***[97] makes art and creative expression more available to those impacted by chronic illness, physical limitations, or difficult social circumstances. ***Arts of Life***[98] is a non-profit foundation with the vision to create a person-centric, working artistic community and provide a work environment of equality and inclusion. ***Hands On***[99] aims to provide access to arts and cultural programs for the Deaf and hard of hearing communities. It provides interpreted performances, and spearheads a theatre program for young artists.

5. Tools and Technologies supporting accessibility

Over the numerous frameworks that have been developed within the scope to address accessibility to cultural content, some have focused on promoting inclusiveness by targeting people's needs with a broader perspective, others focus on addressing physical accessibility issues by enabling the multisensory interaction between the users and the content. The **DynaMus** framework[100], developed in 2015, exploited the possibilities offered by the open data material which is distributed through the web cultural resources, like Europeana and Google, to enable users to create by themselves personalised virtual exhibitions, by using the cultural content that suits best to their interests and creating tailored cultural experiences according to their preferences (Kiourt et. al., 2015[101]; Kiourt et.al., 2016[102]).

Taking a step further, the **MuseLearn Platform**[103], developed in 2020, emerged as an innovative museum guide platform for mobile devices that provided personalised multimedia content for museum exhibits, based on the users' specific needs and preferences. The platform operated based on a content management system that enabled the presentation of the exhibits through multimedia material for better understanding, and also on a recommender system that allowed the adaptation of the information offered based on the needs and requirements of the visitors (Styliaras et.al, 2020)[104]. Stemming from the Universal Design principles and by exploiting the tools provided by advanced technologies, the **IntARSI**[105] project's objective was to offer accessibility to cultural content regardless of physical, cognitive and social restrictions. Thus, the project envisioned a broader spectrum of inclusion and implemented a wide range of technological solutions to achieve its goals. By implementing a sophisticated technical concept to offer an enhanced and multisensory experience, the IntARSI project developed multimedia, virtual and mixed reality applications, tangible user interfaces and effective storytelling techniques. One of the project's practical outcomes was the outlining of a set of basic recommendations for the accessibility to the museum contents,

[97] https://www.artthread.org/
[98] https://artsoflife.org/#
[99] https://www.handson.org/
[100] http://dynamus.ipet.gr/
[101] Kiourt, C.; Koutsoudis, A.; Arnaoutoglou, F.; Petsa, G.; Markantonatou, S.; Pavlidis, G. A dynamic web-based 3D virtual museum framework based on open data. In Proceedings of the Digital Heritage, Granada, Spain, 28 September–2 October 2015; IEEE: New Jersey, NJ, USA, 2015; pp. 647–650.
[102] Kiourt, C.; Koutsoudis, A.; Pavlidis, G. DynaMus: A fully dynamic 3D virtual museum framework, Journal of Cultural Heritage. J. Cult. Herit. 2016, 22, 984–991.
[103] https://diadrasis.gr/portfolio-item/muselearn/?lang=en
[104] Styliaras, G.; Constantinopoulos, C.; Panteleris, P.; Michel, D.; Pantzou, N.; Kapavasileiou, K.; Tzortzi, K.; Argyros, A.; Kosmopoulos, D. The MuseLearn Platform: Personalized Content for Museum Visitors Assisted by Vision-Based Recognition and 3D Pose Estimation of Exhibits. In Proceedings of the 16th IFIP International Conference on Artificial Intelligence Applications and Innovations (AIAI), Neos Marmaras, Greece, 6 May 2020; pp. 439–451.
[105] https://www.mdpi.com/2571-9408/4/2/34

regarding pathways, signs and the overall organisation of contents (Pietroni et.al., 2021)[106]. These guidelines offered a helpful, clear and specific orientation to MuseIT's Virtual Museum design process, although they were originally formatted for physical spaces. Nevertheless, the concept of virtual spaces requires the implementation of similar guidelines as they were ultimately depicted in the framework published by CERTH (see below Chapter 6. Related work by partners). IntaARSI's framework includes recommendations for: easily identified, recognisable and crossable spaces, colour-highlighted rooms, tactile indicators, easily reachable, readable and understandable communication material (texts) and properly installed exhibits and signs. The IntARSI project team pointed out the importance of adaptively exploiting previously developed solutions to make cultural content accessible to impaired persons. Similarly, MuseIT project attempts to exploit previously developed solutions to make cultural content accessible through the virtual reality medium.

6. Policy overview

To form a better understanding of the context in which the work in MuseIT is conducted and where the premises for interactions with cultural assets are set, a further study was conducted by the colleagues at MCA to evaluate EU-level policies on cultural accessibility for individuals with disabilities[107]. The focus was on integrating multisensory, user-centred interactive technologies.

6.1 Existing EU & European-level Policies and Initiatives

The study identified key EU and European-level policies and initiatives aimed at activating Articles 30 and 21 of the ***Convention on the Rights of Persons with Disabilities (CRPD)***[108], which focus on cultural participation and freedom of expression for people with disabilities. Among these, the ***European Accessibility Act***[109] provides a harmonised framework for accessibility requirements across the EU, particularly in digital and audiovisual media, reducing barriers and ensuring equal participation in the digital single market. Complementing this, the ***EU Disability Card***[110], piloted in eight Member States, offers people with disabilities equal access to cultural venues and services such as audio guides, sign language tours, and information tailored to the visually impaired, helping to overcome financial and physical barriers. The ***European Access City Award***[111], established in 2010, recognises cities that prioritise accessibility for individuals with disabilities, evaluating their efforts in creating accessible built environments, public spaces, and communication technologies. The EU's ratification of the ***Marrakesh Treaty***[112] represents a significant step in making published works accessible to people with visual impairments or print disabilities. However, its focus remains largely on visual impairments, offering limited support for other sensory modalities. Additionally, the ***Council of Europe Disability Strategy*** 2017–2023[113] underscores cultural participation as a

[106] Pietroni, E.; Pagano, A.; Biocca, L.; Frassineti, G. Accessibility, Natural User Interfaces and Interactions in Museums: The IntARSI Project. Heritage 2021, 4, 567-584. https://doi.org/10.3390/heritage4020034
[107] https://www.muse-it.eu/_files/ugd/694c76_4d27a5e6227f49829d1e5898c0d55cb1.pdf
[108]https://employment-social-affairs.ec.europa.eu/policies-and-activities/social-protection-social-inclusion/persons-disabilities/united-nations-convention-rights-persons-disabilities_en
[109]https://employment-social-affairs.ec.europa.eu/policies-and-activities/social-protection-social-inclusion/persons-disabilities/union-equality-strategy-rights-persons-disabilities-2021-2030/european-accessibility-act_en
[110]https://employment-social-affairs.ec.europa.eu/policies-and-activities/social-protection-social-inclusion/persons-disabilities/union-equality-strategy-rights-persons-disabilities-2021-2030/european-disability-card-and-european-parking-card-persons-disabilities_en
[111]https://employment-social-affairs.ec.europa.eu/policies-and-activities/social-protection-social-inclusion/persons-disabilities/access-city-award_en
[112]https://www.consilium.europa.eu/en/press/press-releases/2018/02/15/marrakesh-treaty-on-access-to-published-works-for-blind-and-visually-impaired-persons-council-authorises-ratification/
[113] https://www.coe.int/en/web/disability/strategy-2017-2023

fundamental human right, advocating for universal design, reasonable accommodations, and assistive technologies. While this strategy promotes the active cultural contributions of people with disabilities, it is not legally binding for member states, relying instead on shared commitments to inclusivity and accessibility.

6.2 Identified Gaps

The analysis of existing policies in light of MuseIT's work has revealed several gaps that undermine their effectiveness in adoption of inclusive cultural participation. A shortfall lies in the ***limited integration of multisensory approaches***. Current policies primarily target singular sensory modalities, such as visual or auditory accessibility, while neglecting the transformative potential of multisensory technologies incorporating haptic, kinetic, and other sensory inputs. This omission reduces the inclusivity of cultural experiences for individuals with complex or multiple disabilities. Similarly, the current ***areas of focus on access and participation*** are inadequate, where the needs of people with disabilities in accessing and creating cultural assets are often overshadowed by broader accessibility efforts. There is a lack of targeted policies addressing the specific challenges they face as audiences and creators, including not only physical barriers but also social, financial, and attitudinal obstacles, as well as limited visibility for the work of artists with disabilities.

Another critical gap is the absence of ***mechanisms to ensure the sustainability of inclusive practices***. These often rely on the dedication of specific individuals within cultural institutions, leaving them vulnerable to discontinuation when personnel changes occur. Institutionalising these practices is essential to their continuity. Additionally, the lack of ***comprehensive data collection and monitoring*** systems prevents the systematic evaluation and improvement of accessible cultural services. Current reporting frameworks, such as those tied to the CRPD, are limited in scope and frequency, hindering data-driven policymaking.

Support for technological innovation also receives insufficient attention in current policies, particularly in the ***co-creation of cultural assets with people with disabilities***. This lack of emphasis restricts the development of innovative tools that could significantly enhance accessibility. Furthermore, the ***application of universal design*** remains inconsistent, with a predominant focus on ICT and digital realms within the EU. This narrow scope limits the effectiveness of accessibility initiatives in addressing the full spectrum of cultural assets, thereby impacting both audiences and creators. Addressing these gaps is crucial for fostering truly inclusive cultural participation across Europe.

6.3 Future reflections

In light of the identified gaps, our first policy brief was produced emphasising the need for a more ***robust and institutionalised approach*** to cultural accessibility and participation at the EU policy level. Rather than relying on isolated initiatives, comprehensive policies must embed accessibility into the structural frameworks of cultural institutions, ensuring consistency and sustainability. Central to this is ***the integration of multisensory technologies and approaches***, enabling cultural experiences to cater to diverse sensory needs. Universal design principles must be applied transversally across cultural contexts, with the development of standards for multisensory experiences and the promotion of research and innovation in this area being pivotal steps forward.
Additionally, future policies should mandate ***systematic data collection and monitoring of accessible cultural services***. Such frameworks should blend quantitative metrics with qualitative insights from users, particularly individuals with disabilities, to provide a nuanced understanding of

the effectiveness of accessibility measures. This data-driven approach will ensure continuous improvement and alignment with user needs.

There remains a significant knowledge ***gap in understanding the true potential of technological solutions*** in best supporting cultural accessibility and the visibility of creators with disabilities. Technology holds immense potential not only to enhance access to culture but also to empower individuals as creators and professionals. Systematic and granular research into existing technological solutions, their adoption in cultural institutions, and the role of public incentives is essential. These efforts will help uncover untapped possibilities and inform the development of innovative tools and policies, aligning with MuseIT's ongoing focus in this area. The next two policy briefs will attempt to address these issues.

7. Related work by partners

The MuseIT partners have considered the research and information outlined above. This section presents additional work and studies conducted by the members in WP2, furthering previous research, towards achieving the MuseIT aims.

WP2 constitutes the smallest unit of work in the project, nevertheless, most partners have been active in either one or more of the following activities: organising WP2 activities or events, conducting various studies, and actively participating in related meetings and workshops and keeping informed about the insights gained. These include knowledge related to user needs, issues of accessibility and inclusion, and various design methodologies and principles that should be considered in our broader efforts in the project.

We have organised the text in this section, representing the work by partners, under three thematic areas: (a) *exploration of theoretical, methodological, and contextual aspects*, (b) *the results of the participatory workshops*, and (c) *the ongoing work on exploration of the user needs*. The activities by partners overlap and may fall in different areas; still, we found the grouping of the conducted work in this way to be instructive. Each section emphasises the input by some of the partners as well as the results of their efforts.

7.1 Exploring relevant theoretical, methodological, and contextual aspects

The technological development of accessible multisensory cultural heritage exhibitions required significant preparatory work. HB conducted multiple literature studies, some of which are included in earlier sections of this document. In an effort for the project to learn about the experiences of other researches, in order to improve our understandings, and towards informed ideas related to solving inclusivity issues more effectively, MiC contributed to the search of literature, and review of some scholarly papers regarding:

- an inclusive and participatory experience carried out with blind, partially sighted and non-blind children in the drafting, recording and using audio description (AD) for a live opera performance,
- participatory approaches used in disability research in Low- and Middle-Income Countries contexts by the International Centre for Evidence in Disability,
- role of users and Disabled People Organisations (DPOs) in the design and validation of access services.

The work by partner CERTH focuses on exploring, implementing and evaluating accessibility solutions in designing virtual reality environments that present cultural content. CERTH's main role

is to design a virtual environment that resembles that of a physical museum exhibition space, enhanced with accessibility features in a full-immersive and realistic level. Before getting to the development of the virtual space, CERTH conducted an extensive literature review on user requirements for inclusive virtual experiences, in order to identify the challenges and difficulties people with disabilities encounter when interacting with digital applications.

Inclusive design guidelines for physical cultural spaces also fed the knowledge base of the design principles. The results of this research in combination with the designers' experience gained by the development of the virtual exhibition composed the core material of a framework for developing virtual experiences with cultural content, which concluded to the publication "*Enhanced Inclusion through Advanced Immersion in Cultural Heritage: A Holistic Framework in Virtual Museology*" in the Special Issue Electronics and Computer Science for Cultural Heritage: Advancements, Preservation, and Applications of Electronics journal, in 2024. An overview of the literature material and the existing frameworks on inclusive digital design is described in D.4.1[114]. The meaningful insights on the users' requirements as they were collected within the users' needs study of the T.2.1 "Prepare study protocols and conduct user needs study" and depicted in D.2.1[115] "Preliminary user needs specifications" were also incorporated into the designing concept of the virtual museum. Therefore, CERTH conducted a combined research, based on literature sources and users' specifications, for the design of the MuseIT virtual museum.

Based on previous studies, Actronika contributed with insights on the inclusion of haptic feedback using a haptic vest for multi-modal representation of cultural assets. Their contributions also comprised guidelines for designing interaction techniques for navigation and object selection in virtual environments, including the following elements:

The interaction techniques for navigation in the virtual environment should be accessible for all user profiles **–** The default navigation technique that is included in virtual reality development kits requires that users point to the area where they want to translate. This technique is called teleportation. This technique could not be suitable for people with visual impairments.
Haptic feedback should only be integrated whenever it's necessary **–** Designers of multi-modal experiences should not overload users with haptic feedback as it might be counterproductive for the interaction.
Haptic feedback should be accompanied by complimentary stimuli and a context **–** Since the sensations that could be given by a haptic vest are not necessarily correlated with stimuli that we can find in real life; the sensations must be accompanied by auditory or visual feedback that allows the users to better understand what is being represented through a multi-modal representation. In addition, information about the context should be given to the users to inform them about the haptic feedback that is presented in a given situation. Failing to provide this information can confuse the users about the haptic feedback presented in a specific circumstance.

This knowledge enabled CERTH, in collaboration with MuseIT's partners, create a collection of artifacts provided by MuseIT's cultural institutions (ICCU-MiC, MCA) and developed a virtual museum for the exhibition of this collection by adopting an inclusive design methodology and by exploiting the technical tools that current virtual reality technology offers. At present it is under development to incorporate multisensory representations of the artefacts presented in the exhibition.

MCA extended the user orientation and technological guidelines by studying valuable insights from other projects and bringing linked resources from those projects to the development work in MuseIT

[114] https://www.muse-it.eu/public-deliverables
[115] https://www.muse-it.eu/public-deliverables

and enriching it with fruitful concepts of community engagement. These resources help to widen the understanding of the contexts, in which online and virtual cultural heritage exhibitions, and digital cultural objects in general, function. Through active participation in various inclusion-focused initiatives, such as the *DE-BIAS Project*[116] (funded under the Digital Europe Programme, which developed an AI-powered tool to detect bias in cultural heritage collections descriptions, the project worked with specific communities to understand needs and co-design the tool) and as a partner of the *European Data Space for Cultural Heritage*, MCA has worked on a myriad of resources related to inclusion, community engagement, inclusive reuse of digitised heritage and participatory approaches.

A curated selection of resources also relevant to MuseIT includes the *DE-BIAS project community engagement resources*,[117] which includes dozens of community engagement methodology resources, reflections, and recommendations and the *Europeana Inclusive Engagement Guidelines*[118], and other related publications[119]. These resources explore themes related to inclusive and respectful community engagement in cultural heritage, particularly within the digital realm. The resources highlight key points such as:

- **Community Engagement as a Core Principle:** All resources emphasise that community engagement should be central to cultural heritage projects. This means actively involving communities in the co-creation of knowledge, not just as passive recipients of information. The DE-BIAS project, for example, was designed to include community members as partners, with the goal of enriching cultural collections. "Nothing about us without us" reflects the importance of community participation.

  These sources stress that
  - Cultural institutions need to move away from a top-down approach. Instead, they should recognise and value the expertise and perspectives of diverse communities.
  - Community engagement enables a better understanding of topics and contexts and facilitates stronger relationships between the cultural sector and communities.
  - It is critical for cultural organisations to place audiences at the centre of their strategies and activities.

- **The Role of Digital Tools:** Digital technologies are recognised as powerful tools to foster social inclusion and participation in cultural heritage.
  - The resources highlight the use of digital platforms and approaches to engage marginalised communities and to promote cultural democracy.
  - Digital tools can also be used to facilitate access to cultural heritage.
  - For example, digital storytelling is presented as a valuable tool for community engagement. The MEMEX project[120] used digital tools to empower communities to share their stories and claim their rights.

[116] https://pro.europeana.eu/project/de-bias
[117] https://pro.europeana.eu/page/de-bias-project-community-engagement-resources?__cf_chl_tk=0Ri1oZhJH41D1gVNkYkKgvCpEj84CZkGjjlVpGwZB.g-1735826082-1.0.1.1-4VOHpkOsAqnnvTTGUZUgBmwDy09hYaYeyTm.Tas6ozY
[118] https://pro.europeana.eu/page/europeana-inclusive-engagement-guidelines
[119] E.g., Guo, J., & Dong, X. (2024). Digital approaches to inclusion and participation in cultural heritage: insights from research and practice in Europe: by Danilo Giglitto, Luigina Ciolfi, Eleanor Lockley, and Eirini Kaldeli, London and New York, Routledge, 2023, 262 pp., $160 USD (hardback), ISBN 9781032234380. In (Vol. 30, pp. 260-261): Routledge.
[120] https://memexproject.eu/en/

- **The Power and Impact of Language:** The resources emphasise the importance of language in shaping identities and perceptions.
    - Language can be a source of division and misrepresentation if not handled carefully.
    - Cultural institutions must be aware of how language can perpetuate bias and stereotypes.
    - The sources acknowledge that meanings and sensitivities in language can change over time and in different contexts.
    - It is therefore important to re-evaluate historical language and to choose language that is inclusive and respectful.
    - Some terms that were once considered acceptable, like "half-blood" or "Eskimo," are now recognised as offensive and inappropriate.

In conclusion, the studied resources stress the need for a paradigm shift in the cultural heritage sector, which follows the dynamic of MuseIT's ambition moving towards a more inclusive, participatory, and respectful model. They emphasise that cultural heritage is a common good that should be accessible to all, and that language, digital tools, and community engagement are critical to achieving this goal.

7.2 Co-design and co-creation workshops

In this section, we provide an overview of some key activities. The different user engagement activities have been held to gather insights that inform the project about relevant issues. Some activities have aimed to inform others about our work and raise awareness of issues related to inclusion and accessibility. The co-design activities have been held to bring the real lived experiences of participants into our design work, and other participatory sessions have been held to collaboratively explore different ideas and solutions. A more complete account of the different participatory engagements and their findings will be reiterated in an improved, extended version as part of D2.3 That document will place the focus on an overview of the engagement activities and those that have informed the project in more general terms. In this section, we place the focus on workshops that have informed targeted actions and development tasks in the project.

7.2.1 Co-creation workshops in music

SHMU, together with partners involved in WP5 (XSL, SU, CTL and CERTH), have so far carried out 7 Participatory sessions:

Participatory session 1, on low latency architecture was carried out in March 2023. It was a Co-creative JackTrip Jam session, with two remotely performing musicians connecting from different locations in Sweden to a server at Stanford University's CCRMA in (California, USA). At CCRMA, five additional musicians performed in-person. An additional musician connected from a location close to CCRMA. The aim was to confirm that JackTrip offers the effective basis for remote co-creation and to document the event with a focus on the user experience of the partaking musicians during the performance and setup, aiming to suggest improvements for upcoming sessions of similar nature.

Outcome: The results of the workshop were predominantly favourable to the current state of the preliminary design and offered confirmation of its features and structures. But the participants also suggest some adjustments, including adapting, simplifying and streamlining JackTrip set up procedures and additional video feed.

Participatory session 2, on Co-creation and sensors was carried out in June 2023, it was a co-creative artistic workshop session with the aim to collect preliminary data on sensors, exploring spatiality as a contrast to the remote rooms, explore the format of the session and have an internal reflection on how we can develop, session further.

Outcome: Apart from findings that helped us take the technology further, in this session, with two experienced musicians/artist/actors, the level of understanding of the concept of sensors in artistic creation was high. What would happen if we mixed experienced and inexperienced participants? This session was a creative session. That generated a very relaxed environment where everyone in the room, independent of role, felt comfortable in expressing themselves, also in other ways than with words. Team reflections included how we can build on this in future sessions.

Participatory session 3, on Haptic representations and ECG heart rate data was carried out in March 2024, it was two days of co-design work where engineers and end users worked together in workshop settings. The aim was to work with potential users making use of heart rate sensors to evaluate to what extent heart rate signals may be of use in the communication of states of mind and body between remote co-creators (for the purposes of this workshop, the co-creators were in proximity); to work with users to evaluate the effectiveness and comfort of haptic signals in the communication of heart rate and other vibrational information; to begin the process of designing "avatars" which will be visual representations of human states of mind and body to assist in emotional communication within the process of remote co-creation.

Outcome: There were a number of creative exercises including improvisation with different heartbeats. For example, The group co-improvised on anonymous recordings of heart beats related to different emotions and states of mind and body - a man meditating, a woman after intensive exercise, a person very activated and joyful and a rigid techno track based on a fast heartbeat.
Participants found the exercises interesting and enjoyable to work with. Audifications of heartbeats of those in the room produced very strong reactions. Participants described the experience as "strange", "weird" and "spooky" on the one hand and "intimate", "strong" and "very moving" on the other. One participant, among the more musically experienced, reported that she could "feel the energy" of the person whose heartbeat was being audified.
The next stage was communicating the heartbeat through a single haptic actuator that could be held in the hand, pressed against chosen parts of the body or worn in a sleeve. Passions were indeed high, and passing around the actuator seemed to create a less rhythmically obliging but no less emotionally informative experience.
The group discussed avatars as a way of communicating states of mind and body from one remote co-creator to another. Various examples were projected onto a screen in the studio, ranging from realistic faces to cartoon- or emoji-like images, to more abstract shapes. In general participants responded most enthusiastically to expressive and richly colourful "painterly" images of human faces with aesthetic ambition, fantasy and elements of abstraction.
A crucially important point was raised by one of the participants who is a committed gamer. He pointed out that when he chose an avatar, it was because he wanted to become someone else, or more precisely someone other than himself and to feel different things, as opposed to the avatars that we were discussing, which were intended to be true representations of the emotions of co-creators.

Participants also designed avatars for themselves specifically intended to be capable of communicating their true emotions and states of mind and body, in a way that would be useful for remote co-creation.

Participatory session 4, also on haptic representation of ECG and heart rate data, was carried out in April Edinburgh in 2023 and was a continuation of the participatory session 3. The aim was more detailed and objectives were: to implement and explore sensor diagnostic technologies; to repeat some of the heart beat exercises; to implement and explore sensor diagnostic technologies; to follow on from the workshop in Göteborg, exploring colour. ShareMusic together with XSL was carrying out the sessions while also hosting the Consortium Meeting of spring 2024.

Outcome: by using an interface with XSL's colour circle of emotions we could see significant changes in the emotional state of co-creators. Most users were happy with the cameras, Empatica watch and Polar H10 sensors, but one member of the group found the Polar band too tight. The colour experiments were very successful, both creatively and scientifically, and may well indicate a way forwards for encoding colours, emotions and pitches in avatars. As in Göteborg, co-creators responded most strongly to colourful, expressive and painterly avatars. The music resulting from one of the negative emotional images caused some distress, but this was associated with the quality and amplitude of sound rather than its expressive content.
The results with both audified and haptic heartbeats were much the same as in Göteborg. In the same way as in Göteborg, the haptic heartbeat had the most powerful effect on both the ensemble and on observers of the workshop.

Participatory session 5, on Somax and AI, was a jam session held in September of 2024 and brought several musicians and technologists together online to integrate two software tools enabling musicians with disabilities to co-create in music. The goal of the session was to explore AI-driven software trained to interpret signals from the performers.

Outcome: The integration of Somax2 and JackTrip was a positive experience, but to ensure smooth future sessions, the platform needs to be more accessible in terms of ease of use for participants.

Participatory session 6, on EEG and ECG, took place in October 2024 in Thessaloniki. Members of MuseIT and a selection of visitors experienced live EEG audification of their own brains, with some also being presented with a selection of music most closely matching their brain audio. We also demonstrated the haptic heartbeat again.

Outcome: The session was informative for the project members to personally see how this aspect of the project will fit in the overall scheme of the MuseIT platform. Direct qualitative feedback was also received from those who tested the setup, feeding into the continued developments in WP5.

Participatory session 7, on visual representations of feelings, was a co-design workshop together with end users in December 2024. The workshop was a continuation of the work started in Gothenburg in March on avatars. The aim of the workshop was to understand from participants which living avatar representation do users prefer (human / animal / flora); if the pixels avatar effective in sharing feeling information, and what feelings does it evoke; how should avatars change in order to represent changing feelings; to get better understanding of the correct words and terminology to employ with users.

Outcome: The results of this workshop (taking place in December of this month) is still to be analysed further, but some initial observations worth mentioning are that the abstract swarm

avatar may be too complex in current state, colour is very important, there is a strong connection with animals, in general a deep connection with avatars.
We didn't do layering in the end. Layering is difficult in the sense of 3D avatars, hard to implement; 3D difficult to express self, but people were comfortable, participants were not self-critical at all, people were happy with their outputs which recognizes this as potential progression for the next workshop.

Apart from participatory sessions, SHMU, together with SU have also carried out a number of performances of understanding. A performance of understanding is a way to explore and further evaluate the full concept or idea of the remote performance platform and its technology – in a co-creative artistic setting, where the art and the artistic process is the outcome. During 2023 SHMU and SU carried out three techlab residencies, including public sharing[121]:

7.2.2 Testing the virtual museum space

During Thessaloniki's Consortium Meeting in October 2024, CERTH organised a two-level participatory workshop. A significant number of participants consisted of consortium members as well as representatives of local cultural heritage institutions and organisations/stakeholders who work with people with disabilities, took part in the one-day workshop. The participants had the opportunity to experience the virtual museum space, navigate through the exhibition material, interact with the artifacts and their attached descriptions, and provide feedback on their experience through brief focus discussions with the design team. At the second phase of the workshop, the participants, divided into two groups and two time-slots accordingly, took part in discussions about their experience on the engagement of people with disabilities in cultural activities. They provided the MuseIT consortium with meaningful insights on the challenges they face when designing inclusive activities, they shared their experiences' outcomes regarding accessibility in the cultural sector, they transferred their knowledge gained by interacting with disabled people and, along with the consortium members, they discussed the future potentials of the inclusive design.

7.2.3 Co-design and testing of HaptiVerse

On November 7, 2023, two parallel workshops were organised by HB, in Sweden, in which the HaptiWear and HaptiDesigner (two components of the HaptiVerser system) were demonstrated to a group that included participants with functional and sensory impairments, MuseIT members, and a few members of the MuseIT project advisory board (PAB). Both functionality and areas of use and further developments were discussed. It was reassuring to find that all of the suggestions for further development were already included in our then existing plan of work. The workshops also led to the establishment of new contacts and collaborations, among which, a member of the Hapti-Co team accepted to join our PAB, and joint workshops were planned. One of these took place on April 11th, 2024 and another on May 23rd, in which the developed Haptograms were shown and their design and feasibility were discussed. The continued collaborations have included exchanges of the Social Haptic Signs developed by Hapti-co, the list of words relevant for MuseIT, a scheme of reusing same signs for different contexts, and development of the online version of HaptiVerse interface.

Another two-day co-design workshop was organised by HB, in Sweden, on September 25-26, 2024, with members from HB and SHMU, and invited participants representing both MuseIT target user groups - cultural institutions and people with disability - as well as a few PAB members. In this workshop, among others, both the HaptiVerse and sonification and contourification of paintings were demonstrated and tested by the participants. Valuable feedback was received on terminology use and

[121] https://www.sharemusic.se/resources-and-inspiration/techlab-stanford

conceptual thinking, the potential for adoption of the HaptiVerse system, and new areas of use such as developing a set of haptograms for conveying musical notes and the use of HaptiVerse as part of music training and/or collaborative performances.

Another two-day co-design workshop is planned by HB to take place on January 23-23, 2025, at the University of Leeds, focusing on the technical aspects of HaptiVerse, the design of HaptiMesh/HaptiWear, and our work on multimodal digital objects (MMDOs). The outcome of this workshop will be reported in future deliverables.

7.2.4 Workshops for MuseIT partners

The project has also organised multiple activities with or without external participants for gaining and sharing insights with the members as needed. HB has led the efforts in WP2 and has organised various events, seminars, symposia and meetings for MuseIT partners to increase the understanding of accessibility, inclusion, and other relevant issues. All of them will be presented in D2.3.

MiC organized a meeting with a cultural institution, Teatro Stabile of Turin, to help the project members form a deeper understanding of how cultural institutions work with inclusion and accessibility. Teatro Stabile of Turin has been committed to making their theatre performances as inclusive as possible in recent years. The best practices collected by the Teatro Stabile di Torino encompass several aspects.

Before the performance begins, guided and touch tours on stage are organized. The audience is accompanied by one or more actors to discover spaces, costumes, objects, makeup and hairstyles of the characters. These tours are so well organized so that sometimes participants with visual disabilities can be accompanied only by their dog, so they are able to take part independently. In addition, an audio introduction is provided and disseminated in the auditorium at the beginning of each performance and offers helpful hints on accessibility and visual elements.

During the performance, the audience with hearing issues or loss can wear smart glasses or use tablets and smartphones to read the surtitles, which are available in Italian, simplified Italian with sound descriptions and in English. The words are highlighted in different colours according to the characters in the show. In order to encourage the participation of people with autism, among others, for some performances, relaxed performances are provided: lights and sounds are reduced, darkness is not total, and the hall doors remain open during the performance.

Furthermore, the institution website offers simplified reading mode, tailored to suit different user needs (epilepsy-safe mode, blind mode, cognitive disability mode, ADHD friendly mode, keyboard navigation profile, etc.). There is the possibility to set up character, colours, animations and highlighting content. In addition, the website contains an explanatory video with audio, subtitles and a LIS (Lingua dei Segni Italiana, or Italian sign language) interpreter but also the simplified hall card that delves into the plot, characters, author, scenes and costumes. The simplified plot summarizes the development of the story.

From this meeting came the idea to search for other cultural institutions that have dealt with the topic and who have devoted their attention to accessibility. A growing list of cultural institutions was then produced with a specific focus on their best practices.

These institutions will be the starting point to build a strong audience for the event pilot 1 demonstration in Rome, organized within the task T7.3.

During the Consortium Meeting in Cyprus, SHMU and SU arranged an internal learning on inclusion and accessibility for other partners. As a knowledge centre for artistic development and inclusion and with over 20 years of experience of inclusive work, SHMU is also constantly advising project partners on best practice. They have been in working groups on accessible communication, accessible facilitation and accessible venues etc. SHMU also arranged a partner meeting with Ronnie del Carmen to discuss and get advice on avatars and visual interpretations of feelings. Del Carmen is a writer, director, storyboard artist, illustrator, and voice actor. He co-directed and co-wrote the Inside Out 1 movie.

MCA co-organised the first participatory workshop, envisioned as an ideation session, in Paris at IRCAM (Institute for Research and Coordination in Acoustics/Music) in January 2023. The workshop provided participants with an opportunity to share their thoughts on the current options available for people with disabilities to access cultural assets and participate in cultural activities. It also encouraged them to identify the limitations of these provisions, particularly in digital environments, and propose ideas to address these challenges.

MCA has been active in bringing the issues of language and words from their linked resources to be widely discussed during MuseIT workshops.

- **Methodologies for Inclusive Engagement*:*** The resources reviewed outline specific methodologies for conducting inclusive community engagement activities.
    - These include practices such as active listening, transparent communication, and the creation of safe and brave spaces.
    - Open dialogue and empathic processes are crucial for establishing trust and understanding.
    - Storytelling is highlighted as a method for engaging communities, as it is deeply rooted in human communication.

- **Community allies** are presented as essential for bridging gaps between project teams and communities. They act as intermediaries, helping to ensure that engagement is respectful and culturally sensitive.
- The sources also recommend co-creation, where communities actively participate in shaping project outcomes.
- It is important to "meet with empathy" and to circulate meanings within social relationships.

- **Ethical Considerations and Accountability**: The reviewed resources recognise that cultural heritage institutions should be aware of power dynamics and historical injustices.
    - Transparency, honesty, and integrity are key to building trust with communities.
    - The sources emphasize the importance of acknowledging the contributions of community members and ensuring that they receive due credit.
    - Cultural institutions should also be prepared to address conflicts constructively, owning their errors, apologizing, and making amends.
    - The Europeana Inclusive Engagement Guidelines outline accountability measures for ensuring that interactions are respectful and open.

- **Policy Frameworks**: The resources contextualise these themes within broader policy frameworks.
    - European policy models around cultural heritage have evolved from the 1950s to the 21st century and these models have been applied in the DE-BIAS project.

- The sources cite the Universal Declaration of Human Rights, which affirms that everyone has the right to participate in cultural life.
- The Faro Convention is highlighted as a key document for understanding the role of cultural heritage in contemporary society. This convention grants populations an active role in recognizing the values of cultural heritage.
- The European Union's support for cultural diversity and the safeguarding of cultural heritage is also noted.
- The concept of "Audience Development" is presented as a strategic process for placing audiences at the centre of cultural organizations' actions.

7.3 User needs, experiences, and requirement

The period represented in D2.2 includes further studies on general needs of two target groups (people with disabilities and representatives of cultural institutions) as well as requirements in relation to the developed prototypes.

7.3.1 General needs and requirements

On a more general level, MCA and HB co-organized the first participatory workshop, envisioned as an ideation session, in Paris at IRCAM (Institute for Research and Coordination in Acoustics/Music) in January 2023. The workshop provided participants with an opportunity to share their thoughts on the current options available for people with disabilities to access cultural assets and participate in cultural activities. It also encouraged them to identify the limitations of these provisions, particularly in digital environments, and propose ideas to address these challenges.

HB and CTL organized a participatory ideation and data-collection workshop, providing an opportunity to involve stakeholders and users from cultural institutions working with people with disabilities in refining methodologies and approaches of the project. It took place in Nicosia, Cyprus, in October 2023. The participants identified their own activities and experiences of inclusive and exclusive, physical and digital cultural institutions and events. They explained the criteria for such identification and outlined the desired features of inclusive cultural heritage, cultural institutions and their educational programmes. CTL has committed to staying in touch with these groups to evaluate the technologies after their implementation, potentially conducting further testing following the completion of MuseIT. These activities reflect our dedication to creating inclusive, multi-sensory experiences for a broad range of CH audiences.

CTL has focused on developing innovative solutions to enhance accessibility in cultural heritage (CH) by addressing the needs of diverse user groups, including individuals with disabilities. A key use case explored how visual experiences of CH assets can be transformed into audio formats to make them more accessible to visually impaired users. To support this goal, CTL arranged conversations with the CVAR Museum, St. Barnabas School for the Blind, and the School for the Deaf. These discussions allowed us to share our plans, gather feedback on accessibility needs, and ensure that the proposed technologies are aligned with user expectations.

The haptic workshop conducted by HB during an event organised in connection with the *INCLUDE – Centre for Inclusive Studies* provided an opportunity to explore the requirements for haptic communication together with the participants of the event. The testing and ideation in two groups and consequent conversations with the participants provided useful feedback for the developers for the improvement of the equipment and haptic signs.

7.3.2 Requirements for an ontology supporting multimodal and multisensory representations

A similar aim was pursued by KCL, which conducted a workshop during the MuseIT CM in Thessaloniki to identify user requirements for designing an ontology to support multimodal and multisensory representations. The session aimed to engage partners for leveraging the OntoChat framework to collaboratively elicit user stories, competency questions, and ontology requirements.

Motivation for Building OntoChat

Traditional approaches to ontology requirements elicitation were largely manual, relying on techniques like brainstorming, interviews, and text analysis. These methods were often time-consuming, technically complex, and resource-intensive, making it difficult for non-experts to contribute effectively. To address these challenges, OntoChat (see footnotes 122 and 123), provides a human-GenAI collaborative solution, streamlining the process and enhancing accessibility for stakeholders from diverse backgrounds.

Introduction to OntoChat

OntoChat[122] is a conversational framework designed to streamline tasks such as requirement elicitation, competency question (CQ) generation, and ontology testing. It begins by offering a conversational agent with prompt template support[123], designed to assist stakeholders from diverse backgrounds, without prompt engineering expertise, in effectively generating user stories and requirements using LLMs. It has been tested and applied to replicate the requirements collection process for one of the core Inclusive and Multimodal ontologies in the MuseIT project. Next, OntoChat uses these stories to extract competency questions (CQs)—formal queries that the ontology should be able to answer, serving as critical requirements for its design. It employs LLMs to break down complex questions into atomic ones, abstract named entities for domain independence, and generate reusable, high-quality queries. It also incorporates advanced clustering and filtering mechanisms, removing redundancies and organizing CQs into thematic groups, which helps ontology engineers manage and analyse large sets of requirements effectively. For ontology testing, OntoChat adopts a SPARQL-free approach, transforming ontology components into natural language descriptions and validating CQ coverage through LLM-generated prompts. This ensures the ontology aligns with its intended requirements, identifies gaps, and supports iterative refinement.

Goal of the Workshop Session

The goal of this workshop session was to collect stakeholder requirements for their respective work packages, which could be combined to inform the ontology requirements for the multisensory representation of cultural heritage assets. Using the OntoChat framework, we engaged stakeholders from eight diverse domains and professional backgrounds across work packages 2, 3, 5, 6, 7, and 8, including archaeology students, cultural heritage writers, semantic engineers, and others. These participants followed OntoChat's elicitation questions and prompt templates, designed to assist users without prompt engineering expertise in effectively generating user stories and requirements using LLMs. Through this process, they expressed their domain knowledge and specified the requirements relevant to their respective work packages. Additionally, we evaluated their experience by asking them to rate, on a scale from 1 to 5, statements regarding:

- The relevance of the generated user story to their persona, goal, and scenario.

[122] Zhang B, Carriero VA, Schreiberhuber K, Tsaneva S, González LS, Kim J, de Berardinis J. OntoChat: a Framework for Conversational Ontology Engineering using Language Models. arXiv preprint arXiv:2403.05921. 2024 Mar 9

[123] Zhao Y, Zhang B, Hu X, Ouyang S, Kim J, Jain N, de Berardinis J, Meroño-Peñuela A, Simperl E. Improving Ontology Requirements Engineering with OntoChat and Participatory Prompting. InProceedings of the AAAI Symposium Series 2024 Nov 8 (Vol. 4, No. 1, pp. 253-257).

- The usefulness of the generated user story for the MuseIT platform and pilots from the perspective of their work package.
- The relevance of the generated competency questions to their persona, goal, and scenario.
- The usefulness of the generated competency questions for the MuseIT platform and pilots from the perspective of their work package.
- How effectively OntoChat helped in expanding their answers during the creation of their user story.

Findings

The OntoChat session successfully engaged stakeholders from eight diverse domains and professional backgrounds across work packages 2, 3, 5, 6, 7, and 8 to evaluate its ability to assist in generating user stories and competency questions (CQs) relevant to their work packages. The findings from Figure 2 show that 75% of participants agreed the generated user stories were relevant to their persona, goals, and scenarios, and 75% found these stories useful for the MuseIT project. For competency questions, 87.5% of participants rated the generated CQs as highly relevant, while 75% considered them useful for MuseIT. Additionally, 75% of participants felt OntoChat was highly effective in helping expand their answers during user story creation, and 87.5% reported a high level of enjoyment when using OntoChat.

However, across all metrics, approximately 12.5% to 25% of participants reported a less positive experience, which may stem from challenges in effectively interacting with the LLM or limitations in the clarity and relevance of the provided prompts. Feedback indicated a need to refine the prompt templates to make them more intuitive, improve guidance for users unfamiliar with the process, and enhance the adaptability of LLM responses to better align with diverse user inputs. Addressing these areas would help ensure a smoother and more effective experience for all stakeholders.

Figure 2: User Feedback on OntoChat-Generated User Stories and CQs

Future Work
We are now applying design frameworks from GenAI tools in the narrative generation domain to identify interface design patterns and user interaction strategies. This will help further enhance the user-friendliness of OntoChat, specifically in supporting users in effectively generating user stories and competency questions.

7.3.3 Lived experiences related to limitations and opportunities

Another study involving people with disabilities was conducted by HB. A number of interviews were conducted on lived experiences, regarding limitations that prevent accessibility to members from the disabled communities, to complement the findings from related literature reviews. Six in-depth dedicated interviews were conducted. Two interviews were conducted on location in person, three were conducted online via Zoom, and one was conducted using an online text-telephony communication system[124]. This section presents a summary[125] of the findings from these extended in-depth interviews.

Participants:

The participants comprised 3 men and 3 women. As communication and interaction with visual and auditory cultural assets becomes most challenging for those who live with deafblindness, five out of six were participants with acquired deafblindness and the final one was a participant with functional disability. Most participants, those with acquired deafblindness, lived with some form of Usher syndrome, where one participant described her condition as follows:

> *"I have Usher syndrome type 2A. So, I was born hard of hearing and started to become clumsy at around... age 19. And that's when I got diagnosed with Usher syndrome. I got registered as blind about seven years ago. So now, I have very, very narrow to no vision. Like blindness. I use a cane. I use a guide dog, and I'm a hearing-aid user. I lip read."*

All participants led active professional lives, while the severity of their impairments did not often seem that noticeable to casual on-lookers. One participant explained:

> *"I might act as if I see a lot but it's I, I, don't see that much and the reason I function as if I do see a lot is because my brain constantly creates a unity through all the sensory information. So, when I .., but when I look at something it's, it's, it's, it's minimal part, it's, it's, I mean, it's really almost nothing. When I look at you, I don't see you as a unity, I only see a really small part of you, it's like this [showing with a hand gesture a very small circle with her thumb and index finger], or whatever on the screen."*

Interactions with cultural assets:

The interview participants all expressed the value of interactions with arts and cultural assets and shared a wide variety of interactions with arts and cultural assets, ranging from visiting museums, galleries, cinema, and concerts, to exploring innovative sensory and interactive experiences.

The participants emphasised the importance of cultural activities in expanding personal horizons and maintaining connections to society. For the participants, these activities served as a vital link to the broader world, counteracting isolation. One participant explained, *"Any cultural activity is really*

[124] https://texttelefoni.se/
[125] A more detailed report on these interviews is being worked on as part of a scholarly paper.

opening up and keeping me related to the bigger world, the society, other options. So that's why, to me, that's extremely important and I use it to stay connected."

The nature of these interactions varied widely. Some participants described multi-sensory experiences in museums, where tactile exhibits, smells, and even tastes brought history and art to life in unique ways. For example, one participant recounted a museum visit where they could touch Viking boats, feel different fabrics, and even smell and taste elements of the historical narrative, calling it *"a complete experience with smells and other elements."*

Others highlighted immersive activities that offered entirely new perspectives, such as simulating walking on the moon or experiencing weightlessness through specially designed exhibits. One participant reflected on the sense of freedom they felt during such an activity, stating, *"It was really weird to feel totally free—no cane, no need for someone else to help me."*

Additionally, some participants explored creative technologies, such as tactile paper or 3D printing, to make cultural materials more accessible and engaging. These tools were said to allow them to experience visual or physical elements in a more inclusive manner.

Overall, the findings revealed a broad spectrum of interactions, demonstrating the potential of cultural activities to provide inspiration, connection, and joy when designed to include diverse ways of engagement.

Positive experiences and multisensory interactions

Participants provided numerous examples of positive experiences of interactions with arts and cultural assets, with nearly all involving some form of multisensory interaction. These interactions were not only inclusive but were described as enriching, allowing participants to engage with exhibits in ways that resonated with their own needs and preferences.

One participant highlighted the success of a project designed to make museums more accessible to individuals with deafblindness. That project focused on tactile engagement, featuring an interactive installation of a tree that allowed participants to experience music through touch: *"It was 100% natural, no technology at all, and it was 100% touchable for the whole body... If you can think in touch and do something direct in touch, it is the very best experience."* Similarly, another participant described the value of tactile materials such as maps and artwork, emphasising how they enhanced her connection to the exhibits: *"The effort to see the text is tiring, but it's really fulfilling to touch."*

Multisensory experiences were especially appreciated when they blended tactile elements with other sensory modalities. For instance, a participant recounted a Van Gogh and Klimt exhibition where she was able to feel 3D paintings, touch fabrics related to the artwork, and hear music historically linked to the pieces. She explained how this approach created a more immersive and personal experience: *"Through feeling the fabric, the painting becomes more 3D for me. It's not only the small fabric I'm holding; I connect it to the dress and create a painting inside my body-mind."*

Beyond the exhibits themselves, participants noted the importance of the context in which these interactions occurred. Allowing ample time to explore specific pieces, rather than rushing through an entire exhibition, was identified as a significant factor in creating meaningful experiences. One participant described how this approach enriched her understanding: *"They choose certain pieces and really have time for you to explore, experience, [...] the first time that happened I felt like, oh, I miss out a lot, all those pieces they don't show me, but in the end, this gives me much more, because it really gave me the feeling of capturing some of this exhibition."*

Human interaction also played a key role in positive experiences. Engaging with knowledgeable museum staff or guides, as well as encountering art that resonated with the participants' personal experiences, added layers of meaning. One participant, reflecting on a Cézanne painting, remarked: *"I asked the lady, 'Was he also visually impaired?' because the way he's painting... I recognise it; ...he captures some of the beauty but it's not so specific. So, it.., you kind of recognise the way of seeing the world, looking at the world."*

Participants further appreciated when institutions actively sought their input and provided tailored support. As one participant observed: *"They really ask, 'What is it you need?' and have an idea of which places work best for you."* This proactive involvement was seen as an important step in creating inclusive and accommodating cultural experiences.

Barriers

All participants described various barriers that limited their ability to fully engage with arts and cultural assets, particularly for individuals with deafblindness who rely heavily on their residual sight and hearing. Barriers affecting these senses were particularly pronounced, with poor lighting and inflexible pathways often cited as significant challenges. Inconsistent or dim lighting, such as uneven spotlights, were said to make it difficult to navigate spaces and interact with exhibits. As one participant explained, "*Spotlights mean a very bad lighting condition because the lighting isn't the same in the whole room.*" Another participant shared frustration with rigid pathways, noting that predefined routes in museums prevented them from returning to specific sections they found particularly accessible or interesting.

Access to information was another critical area where barriers were encountered. Participants highlighted the need for inclusive formats, such as large print, Braille, or accessible websites, to better accommodate their needs. Accessible audio-visual content was valued, with flexibility to meet different needs. One participant with low vision remarked, "*The text has to be very large; otherwise, I just don't bother reading.*" Similarly, another participant with hearing impairment valued captions in videos as essential for reducing the effort required to engage. She described, "*I don't want to put that effort to listen when I can see captions. Captions, yes.*"

The physical design of exhibits and equipment also posed challenges. Display screens were said to be often positioned too high or awkwardly, making them inaccessible without assistance. One participant who uses a wheelchair described, "*The screens were too high; I couldn't reach them.*" Additionally, exhibits placed in dimly lit rooms or requiring detailed visual focus were particularly taxing, with participants noting how these conditions caused unnecessary strain and fatigue.

Participants frequently described the cumulative impact of these barriers as making cultural experiences physically and mentally exhausting. This often detracted from the joy and engagement that arts and cultural assets could otherwise provide. Most participants expressed a desire for greater consideration of their needs, highlighting the importance of inclusive design and adaptive features to ensure that cultural spaces are accessible to everyone.

User experiences of VR

Participants' experiences with virtual reality (VR) systems varied, from having no prior experience at all to engaging with multiple systems incorporating advanced haptic technologies. Despite this diversity, common themes emerged around accessibility, design considerations, and the importance of sensory alignment in creating an immersive and enjoyable VR experience.

Even participants without direct VR experience offered valuable insights into potential design considerations for virtual museums. One participant suggested the importance of an overview to aid navigation and decision-making, explaining, *"If you don't know Mona Lisa is in that museum, you can't choose to get more details."* The interviews highlighted the need for intuitive interfaces that provide users with clear and accessible information upfront.

Participants with VR experience identified significant challenges when sensory modalities were not effectively supported or aligned. For example, one participant described experiences with VR games intended to evoke fear but found them ineffective, or even comical, due to a lack of visual input: *"It was kind of funny, [...] like all kinds of scary stuff going on, and even, it was actually funny because [...] I missed what was so scary."* Similarly, participants noted the disorienting effects of VR environments that failed to synchronise visual feedback with bodily awareness. One participant remarked, *"If my body isn't moving and I see I'm moving, my brain was, kind of, 'what's going on?!' It was really disturbing."*

Haptic feedback emerged as a critical feature for enhancing VR experiences, particularly for participants with visual and auditory impairments. Participants valued tactile sensations that resonated with their real-world experiences and preferences. One participant described their experience with a VR system, highlighting the difference between overly dominant tactile sensations and those that felt natural and subtle. They explained, *"If it's resonating with my tactile sensations in reality, it works really well for me. If it's not and it's really dominating, I dislike it."*

Participants also expressed a preference for customisable and responsive VR systems, emphasising the importance of user choice in sensory engagement. This included options to control the intensity, duration, and activation of haptic feedback. One participant explained, *"I'd like to have that option rather than be stuck with just one."* Others suggested features like proximity-based tactile feedback that strengthens as users approach an object, providing a more intuitive and immersive experience.

In terms of designing virtual spaces, participants were divided on whether VR environments should replicate physical spaces or embrace the flexibility of the digital realm. However, the consensus was that spacious and accessible designs, reflective of bodily and sensory realities, were essential. One participant elaborated, *"Especially in virtual reality, I would say create a spacious museum! Why not? It doesn't cost you in that way. You don't have to clean it!! Yes, it definitely matters, because as I pointed out many times now, that there is always a relationship with your bodily.., your physical experience. And when deafblind, this relationship becomes even stronger."*

Overall, participants highlighted the importance of thoughtful VR design that respects and aligns with their sensory needs, offering both inclusivity and the ability to personalise their interactions.

User experiences with haptics

Participants shared a range of experiences with haptic technology, emphasising its utility in enhancing accessibility and communication. Haptics were described as intuitive and versatile ways of interactions that could convey information and enable actions in situations where visual or auditory cues were insufficient or unavailable.

One participant recounted their experience with haptics in smartphone photography, noting its subtlety and effectiveness. They highlighted how haptic feedback helped provide non-visual cues, saying, *"You can see the line, but you can also feel it—it's a very soft and subtle setup."* In a workshop, one of the participants' feedback had even prompted the professional developers present at the workshop to notice and pay closer attention to the potential of haptics in their devices. The

participant also described the learning curve of recognising different haptic signals, such as distinguishing between notifications, messages, and reminders, which they mastered over a couple of weeks.

Haptic technology was also seen as an intuitive way to deliver time and task-related information. A participant described how their smartwatch used unique vibration patterns to indicate the time or notify them of events. *"It's very detailed. So, you can receive all kinds of information that way. I started noticing new messages, notifications, and calendar events. I could tell the differences. It's really intuitive."*

Beyond personal devices, participants highlighted innovative uses of haptics in outdoor and collaborative activities. One participant discussed the development of a haptic wearable integrated into their climbing gear. This system, designed to facilitate non-verbal communication between climbing partners, used vibrations on different sides of the body to signal directions or actions. *"If my climbing partner taps on one side, I can feel it and know which way to go. If they tap on the left, it might mean I need to go left."*

The participants further elaborated on the potential of haptic codes for enhancing safety and efficiency during sporting activities. For example, tapping both sides could signal "stop," or specific patterns could indicate when to speed up or slow down to conserve energy. These features were seen as particularly valuable in challenging conditions, such as poor visibility or noisy environments, where reliance on sight or hearing was not feasible.

Overall, participants highlighted the adaptability and accessibility of haptics, indicating its potential to enhance both everyday tasks and specialised activities.

User view on contourification and sonification

Participants provided diverse perspectives on technologies designed to make visual art more accessible, such as contourification (enhancing image outlines for tactile exploration) and sonification (enriching paintings with sound). While these methods were appreciated for their potential, participants also expressed reservations about their current usability and alignment with their sensory needs.

One participant noted that while contourification could help in certain situations, it often requires significant cognitive effort to piece together an entire image. They suggested tactile methods, such as interacting with surfaces that provide varied textures or vibrations, as more intuitive alternatives: *"To get a view of the whole painting, I really don't know... you have to remember very much information to get the whole. I think you have to touch a surface with your hands and get information that way."*

Another participant highlighted the importance of grounding these technologies in the lived experiences of non-visual users. They felt that current approaches often reflected a sighted perspective, lacking the physical and intuitive layers that are central to their sensory interactions: *"It felt like a visual person creating something for a non-visual person... it felt really cognitive, and I really missed the physical layer in it."*

Concerns were also raised about the tasking nature of some proposed interactions. Participants expressed a preference for solutions that minimise effort and integrate seamlessly into their routines. For instance, a participant commented on the challenges of using a mouse to explore images and proposed tactile tablets as a more effective alternative: *"Using my mouse is not something I do for*

fun... but if what is on the screen could be projected on a tactile tablet, then I could combine it again, and then you have more of a unity."

Participants expressed openness to future developments in contourification and sonification technologies, envisioning scenarios where these tools might integrate layered tactile feedback with audio descriptions to create a more cohesive and immersive experience. One participant described their ideal system as one that allows for selective exploration of a painting, such as focusing on specific objects or corners, through a tactile interface that could gradually improve in sensitivity and detail over time.

Despite their reservations, participants acknowledged the potential value of these technologies as building blocks for more accessible and enriching cultural experiences. They emphasised the need for iterative development and collaboration with users to ensure these tools align with their needs and preferences. One participant summarised this sentiment by stating, *"As it is right now, it's not helpful for me, but as a building block, I can imagine it's valuable, sure."*

The interviews emphasised the importance of designing accessible technologies that balance cognitive and physical effort while offering flexible, layered interactions to meet the diverse needs of users.

Insights into disability

Participants offered insightful reflections on the lived experiences of disability, highlighting how sensory impairments influence not just individual senses but the entire way they interact with and perceive the world. Their accounts reveal the complexity of adapting to a world predominantly designed for sighted and hearing individuals and the importance of true inclusivity that acknowledges diverse ways of sensing and connecting.

One participant described how becoming visually impaired or deafblind involves more than the loss of sight or hearing. Instead, it entails a complete shift in the sensory system and how one relates to the world: *"When you become visually impaired or deafblind, it's not just sight and hearing that is changing; it's all your sensory system. It's not only about compensating for what is lost but a totally different way of connecting."* This reconfiguration of sensory experiences was described as something that is difficult to grasp for those who do not live with disability. They also highlighted the gap between theoretical knowledge of disability and the deeper, experiential understanding needed to design truly inclusive environments. One participant explained, *"Because of the dominance of the sighted and hearing world, me and other deafblind people are constantly adjusting to that world... True inclusivity requires time, it requires effort, and it requires discomfort."* By such examples they highlighted the emotional and cognitive toll of constantly adapting to a world that often overlooks the lived realities of disability.

Another participant articulated a powerful message to designers and the research community, emphasising the importance of creating shared spaces that honour and integrate their unique sensory perspectives: *"You are trying to bring me into your world, which is good-sight and well-hearing, and in a way that is painful, because I will never be good-sighted or well-hearing. So please allow me to be myself in a shared world, adding something of my way of sensing, which might enrich you as well as you enrich mine."*

The participants' accounts also highlighted the profound impact of environments designed with accessibility and autonomy in mind. One participant recounted the liberating experience of navigating a carefully designed exhibit independently: *"For the first time, you were free. You didn't*

have any assistance because the route was planned and safe for you as a blind and deaf person." This independence was contrasted with the helpful but often over-reliant nature of assistance from others, highlighting the value of environments that empower individuals to explore freely and safely.

The interviews reinforced the need for inclusive design to move beyond compensatory measures and embrace a deeper understanding of the lived realities of individuals with disabilities.

What information would the user be interested in receiving:

Participants provided nuanced insights into the types of information they would like to receive from cultural experiences, such as museum visits or interactive technologies, emphasising the importance of balancing detail, context, and personal choice. Their responses highlighted the need for flexibility in how information is presented and the importance of reducing cognitive and sensory strain.

Several participants expressed a desire to tailor the level and type of information they receive based on their purpose for engaging with an experience. For instance, one participant explained, *"If I go to see Mona Lisa, then I want a good description of that or a good tactile adaptation... but sometimes I go to a museum without a wish to get to know a specific painting or object. Perhaps I only want an overview of what there is."* They also indicated the importance of providing both detailed and high-level overviews, allowing users to decide how deeply they wish to engage with specific content.

Participants emphasised the value of contextual framing to aid sensory interpretation. One participant explained, *"If you only feel texture without knowing what it is... it takes a lot of effort to keep searching for what it is that I feel... The moment I already get some basic information, like, 'This is a painting of a dog,' then my brain is just okay, we open the drawer for dogs."* This framing helps users process sensory information more effectively, enabling them to focus on finer details and enjoy the experience more fully.

However, participants also highlighted the cognitive load associated with combining multiple sensory modalities, such as speech and tactile inputs. One participant explained, *"When, for example, something is being said and I have to focus on feeling something, that is really tasking. It wears me out and kind of irritates me... This combination is more tasking."* Similarly, participants cautioned against overloading users with "tactile noise"—excessive or constant tactile feedback—which requires constant attention and can create fatigue and discourage engagement.

Participants expressed a preference for systems that allow customisation of sensory inputs and interactions. For example, one participant suggested that tactile or haptic systems should provide users with choices, enabling them to adjust the level of feedback or focus on specific elements: *"Anything that's really tasking creates a threshold for using it... So, personally, I would prefer a choice."* This sentiment was echoed in suggestions for action-based feedback, such as using vibration patterns to convey the speed or movement of a person or object.

Overall, participants emphasised that the design of information systems should prioritise user autonomy, reduce unnecessary effort, and provide clear, contextually framed sensory inputs.

Personal strategies:

Participants described a range of strategies they have developed to navigate and enjoy cultural experiences while managing the challenges faced. The descriptions demonstrated resourcefulness and adaptability, as well as a balancing act between overcoming barriers and making the most of their sensory capabilities.

For most, planning was key to ensuring a successful experience. One participant highlighted the importance of preparation: *"As a person with deafblindness, it is difficult to visit a museum without planning. I need a guide or an interpreter, and that must be planned before. But even if I have a guide or an interpreter, I want to have my own experience of the museum."* This and other comments indicated the need for both logistical foresight and autonomy in how the experience is shaped.

Participants also discussed specific tactics for optimising sensory inputs in different contexts. For example, one participant described how they use custom settings on their hearing aids for concerts to avoid sound distortion or choose seats that balance proximity and visibility: *"I always choose to pay a little extra so that I am very close to the stage, but I always have to choose to be on the side... it's always a little bit, you know, the third row, on the side—it's a very specific place where I try to find the seat so I can grasp as much as possible."*

Adapting seating positions was a common strategy for several participants. In cinemas, one participant opted to sit further back to capture more of the screen within their field of vision, even if it altered the immersive experience: *"I find [cinemas] slightly harder, especially if it's an action movie. When there are lots of movements, it's hard for me to see with my tunnel vision. So I started to sit slightly further back so I can see more of the screen."*

Participants frequently made conscious choices to focus their attention on specific elements of an experience, allowing them to find joy within the constraints of their sensory limitations. One participant shared their approach to watching dance performances: *"I often choose one dancer and follow that one and enjoy the pathway of the dance of this one person... I notice that in conversations, because I am so consciously choosing how I want to enjoy it, and I'm okay with missing out."* This acceptance of limitations, coupled with deliberate focus, enabled this participant to create rich and meaningful experiences despite the inevitable challenges.

Energy conservation was another critical factor influencing participants' choices. One participant explained that the cognitive and physical effort required for certain activities often outweighed the benefits: *"It makes you tired to see all the different pictures, to get all the visual information... I'm just saving all the energy for daily life. It doesn't feel like it's worth spending my energy on galleries or museums."*

These strategies reflected the participants' resilience and adaptability, as well as their ability to tailor experiences to their preferences and limitations.

8. Summary and conclusion

In MuseIT, the ultimate goal is to achieve equitable access to, and engagements with, cultural assets and experiences. We contribute to raised awareness and promotion of environments, products, and services that are usable by all individuals, in some shape or form. This would involve intuitive operation and accessibility for diverse abilities by offering features like multi-layered interactions, multisensory representations, and flexibility to accommodate individual needs and preferences. Achieving this goal would require to actively involve user groups, particularly those traditionally excluded, in the design process. This participatory approach ensures that solutions are not only functional but also tailored to specific needs, such as providing tactile models for individuals with dual sensory impairments. While Universal Design seeks to develop single solutions that accommodate all users, Inclusive Design focuses on adaptability, often creating multiple pathways to meet diverse requirements. Both frameworks are vital for addressing the broad spectrum of accessibility challenges in the CCI.

8.1 Summary of Inclusion and Accessibility Designs in the CCI

The review of current practices in the CCI reveals both significant advancements and persistent challenges. There are numerous positive examples, especially in the physical domain, where organisations have enhanced accessibility by incorporating tactile guidance systems, sensory-friendly spaces, and well-designed signage to improve navigation. The integration of assistive technologies, such as screen-reader-compatible websites, keyboard navigation, and virtual tours, has also made cultural content more accessible. There are also examples of efforts of creating multisensory experiences, offering meaningful engagement for a wide range of users.

However, there are clear gaps in implementation. Many digital initiatives fall short of their inclusive aspirations due to incomplete compliance with accessibility standards. While some institutions excel in providing adaptive tools and accessible content, others remain hindered by resource constraints or limited technical expertise. Moreover, the heavy reliance on physical adaptations, such as ramps and tactile signage, often overlooks the importance of digital and content accessibility, particularly for remote users.

The review also highlights significant barriers that persist despite these efforts. Digital inequality remains a pressing issue, with limited access to technology preventing many from engaging with digital cultural content. Additionally, while some cultural institutions engage directly with users in the design process, others develop solutions without sufficient consultation, leading to mismatches between the offerings and user needs. Emotional and cultural barriers further compound the problem, as individuals often feel excluded by forms of engagements that fail to address their specific requirements.

8.2 Proposals for New Methodologies for Digital Interactions

To address some of the identified challenges and to enhance inclusion and accessibility in the CCI, based on our analysis, new methodologies must prioritise user-centred approaches, scalability, and innovative ways of engagements. Digital interactions should include multimodal and multisensory elements, enabling users to engage with content through modalities that suit their preferences. Examples could include integrating haptic feedback and auditory cues into virtual exhibits to create richer, more inclusive experiences for users with sensory impairments. Similarly, the development of AI-powered platforms could allow users to personalise their interactions, adapting content to individual preferences and needs. However, use of AI and new technologies should go hand in hand with ethical considerations and transparency. Users should be informed when AI-driven tools are employed, and their data must be handled with care to protect privacy and build trust.

Participatory design should be a core part of these efforts. Involving diverse user groups throughout the design and testing phases ensures that solutions are both functional and meaningful. Workshops, focus groups, and iterative testing can provide valuable insights into the lived experiences of individuals with disabilities. This process should also extend to staff training, raising awareness and providing them with skills for improved implementation of accessibility and accommodating diverse needs. Finally, adoption of user-centred, participatory, inclusive design methodologies should extend beyond one off, stand alone projects, but rather employed on a broader scale to shape organisational strategies, embedding accessibility as a fundamental value across all cultural initiatives.

8.3 Concluding remark

To address the challenges identified, it is further recommended that policies relevant for the issues discussed in this report to explicitly promote multisensory cultural experiences, making cultural spaces and digital platforms accessible through diverse sensory modalities. There is also a need for enhanced visibility and support for artists with disabilities, ensuring their active engagement within the cultural sector. Further, establishing partnerships between cultural institutions, technology developers, and advocacy groups is crucial for advancing innovation in accessible cultural technologies. By implementing these strategies, the EU can build a more inclusive cultural landscape, enabling equal participation for all individuals across its member states.

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