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SHIFT

MetamorphoSis of cultural Heritage
Into augmented hypermedia assets
For enhanced accessibiliTy
and inclusion

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Abstract:	The general objective of this report is to provide an overview of the entire series of activities dedicated to the planning, implementation and evaluation of the SHIFT requirements. In this respect, the document elaborates on the technological requirements as these are mandated by accessibility standards and guidelines. It also describes requirements elicitation through a user Questionnaire, carried out in the period M1-M6 and planned by the consortium of SHIFT partners for the same period, and how these actions have reached their potential to be fed into other WPs. Finally, it introduces user evaluation methodology and acceptance metrics for the SHIFT technologies.
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Authors

Name	Organisation	Role
Moritz Maier	DBSV	Deliverable Lead
Ioana Crihana	ANBPR	Contributor
Tvergyák Klaudia	SOM	Contributor
Milena Milosevic	BMN	Contributor
George Margetis	FORTH	Contributor
Stavroula Ntoa	FORTH	Contributor
Andreas Bienert	SMB	Contributor
Katja Hesch	SMB	Contributor

REVIEWERS

Name	Organisation	Role
Krishna Chandramouli	QMUL	Reviewer
Razvan Purcarea	SIMAVI	Quality check

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Abbreviations and Acronyms

Abbreviation / Acronym	Description
AI	Artificial Intelligence
ANBPR	The National Association of Librarians and Public libraries in Romania
AR	Augmented Reality
BMN	The Balkan Museum Network
CCI	Creative and Cultural Industry
CH	Cultural Heritage
CHI	Cultural Heritage Institution
D[numeral]	Deliverable
DoA	Description of the Action
EC	Exhibition Case
EU	European Union
FORTH	IDRYMA TECHNOLOGIAS KAI EREVNAS
GDPR	General Data Protection Regulation
ICT	Information and Communication Technology
ISO	International Organization for Standardization
M[numeral]	Month relative to the project timeline
ML	Machine Learning
QMUL	Queen Mary University of London
SIMAVI	Software Imagination & Vision
SMB	Staatliche Museen zu Berlin - Preußischer Kulturbesitz
SOM	Magyar Nemzeti Múzeum – Semmelweis Orvostörténeti Múzeum
TTS	Text-to-Speech
UI	User Interface

UX	User Experience
VR	Virtual Reality
W3C WAI	W3C Web Accessibility Initiative
WCAG	Web Content Accessibility Guidelines
WP[numeral]	Work package
XR	Extended Reality

Glossary of terms

Terminology	Description
Machine Learning	*Machine learning is a subfield of artificial intelligence that gives computers the ability to learn without explicitly being programmed[1].*
Computer Vision	*Field of artificial intelligence in which programs attempt to identify objects represented in digitized images provided by cameras[2].*

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[1] See at: https://mitsloan.mit.edu/ideas-made-to-matter/machine-learning-explained
[2] See at: https://www.britannica.com/technology/computer-vision

1. INTRODUCTION

Since the dawn of content economy several decades ago, user engagement has been placed at the heart of digital transformation strategies being adopted within the creative and cultural industry (CCI) engagement with citizens [1]. The trend is complemented by the changing demographics across Europe, where increasing numbers of citizens and users of content economy demand high-quality content. The demand is further driven by the generation of digital natives, who are seeking information from "born-digital" platforms. Despite the wide scale of adoption of digital transformation strategies being widely successful across several industrial sectors, the uptake of such strategies within creative and cultural industries has been found lacking. While the adoption of digital transformation strategies has been expedited since the outbreak of COVID-19 pandemic in the year 2020, there is a clear lack of a strategic roadmap on how to enhance the uptake of digital tools within the cultural heritage institutions. Despite several initiatives been undertaken to bridge the digital divide among the citizen groups, the lack of accessibility and inclusion by design standards (as outlined in Section 3) available to be adopted within cultural heritage institutions has been identified as a challenge to be addressed.

Digital content accessibility refers to the inclusive practice of making digital contents usable and comprehensible by all citizens (with abilities and disabilities included). Within the current adoption of digital transformation strategies, the notion of accessibility has been widely addressed within the context of information being shared through Internet services. The relevant standards published from W3C on Web Accessibility Initiative (WAI) individuals' formulated recommendations on creating accessible for all content published online. The recommendations on adopting universal design, which includes the triple synergy between Usability, Accessibility and Inclusion, has been well addressed in the literature [2]. Nevertheless, the lack of support for integrating such accessibility standards within individual organisations has been well documented [3], resulting in the information published from cultural heritage institutions and other CCI stakeholders to become inaccessible. Additionally, the lack of multimodal, user engagement tools has resulted in unimodal representation (in text) of historical content. The representation of conservative and generic content, that cannot address different individual's needs and preferences, has been identified as a key limitation in engaging a wider public. Despite the popularity of audio-visual content, commonly encountered within the CCI, limitations and barriers are still preventing Audio Visual Media Accessibility, being related to usability,

interoperability, and standards issues, as well as lack of business-case for take-up by mainstream actors, legal barriers (for example for the transnational reuse of accessible content), difficulties in the reuse of accessible content over time and across different platforms [4]. These challenges need to be overcome for delivering wider access to the cultural heritage content to many communities. Museums have a duty to cater to people with a wide range of needs and this includes visually impaired people [5]. This is not a small section of society, and it is vital that they are not overlooked. Globally, there are approximately 1.3 billion people living with some form of blindness or visual impairment. In the USA alone there are around 25.5 million people experiencing vision loss. For many, a visit to a museum has the potential to make them feel excluded. The traditional museum experience of objects behind glass does not offer much to a person who is blind or partially sighted. But museums are evolving to meet this need and to make a visit an enjoyable experience for all.

For people with a disability such as a hearing, sight or mobility impairment, effective engagement with digital media content and interacting with social media applications provide extra barriers. Following the reports on aging population across Europe, there is a critical need to develop digital technologies considering inclusion by design principles. Addressing the challenge, in 2015, Netflix launched the Accessible Netflix Project (ANP), with the vision of offering audio description of its original content [Daredevil, House of Cards, Orange is the New Black] for its vision-impaired audience. While a television show featuring a character with an impairment such as Daredevil's Matt Murdock's vision impairment would be of interest to theorists in critical disability studies, the question of whether the program itself is accessible to viewers with the same impairment has not garnered much attention [6]. Despite an increase in the design and development of assistive technologies which has been released in the market for over a decade, the lack of content production tools and services focused on cultural heritage has negatively impacted the market uptake of such assistive technologies. As an instance, the use of Haptic solutions to offer a sensory experience of touch and otherwise, has not gained popularity among people with disabilities and otherwise, because they offer limited and very basic functionality to the users, e.g., white canes [7]. Additionally, the inclusion by design principles should consider literacy levels of citizens, refugees, heritage of immigrants to offer a holistic experience to all public for experience cultural heritage. Addressing these shortcomings, it is vital to consider the inclusive design principles, which is aimed to remove the barriers that create undue effort and separation. Information created, shared, and distributed should facilitate everyone to participate equally, confidently, and independently.

To overcome some of the key barriers CH institutions has adopted new ways to engage with visitors [8]:

- **Audio description:** Provide either regular tours with trained guides or recorded audio description guides that visitors can borrow. Ensure that the range of people reading recorded audio description is representative, considering factors like age or gender.
- **Creative workshops:** Small adaptations to a workshop can make a big impact. In art workshops, involve embossing, textiles, clay, creating 3D work with pipe cleaners, wikki stix or mod rock bandages.
- **Tactile interpretation and tours:** Getting close to objects is important and creates an active experience for visitors. Provide sensory backpacks with materials or objects related to the collection on display. 3D models are not just replicas, but also provide an alternative way of exploring objects. Raised touch tiles give a physical indication of the visual shapes and textures of the work.
- **Multi-sensory experiences:** Music and smell can both reflect historical context. You could create a soundtrack inspired by the collection, or smell boxes to accompany an exhibition.

Addressing these various limitations and building on the past experiences and expertise among hte consortium partners, the SHIFT project is strategically conceived to deliver **a set of technological tools, loosely coupled, that offers cultural heritage institutions the necessary impetus to stimulate growth, and embrace the latest innovations in artificial intelligence, machine learning, multi-modal data processing, digital content transformation methodologies, semantic representation, linguistic analysis of historical records, and the use of haptics interfaces to effectively and efficiently communicate new experiences to all citizens** (including people with disabilities). To facilitate the development of tools and technologies, the delivearble reports on the activiites carried out in the project aimed at gather user requirements by launching a stakeholder consultation. The consultation is designed to identify user needs across four (4) exhibition cases as outlined in Section 2. Subsequently, in Section 3, a review of current standards available to bridge the gap between the digital divide among citizen groups is summarised. In Section 4, a list of all the ongoing activiites to promote curation, accessibility, inclusion, storytelling are outlined. Section 5 summarises the user requirements and offers user evaluation and acceptabilty metrics. In section 6 we aggregates the preliminary user requirements identified for the SHIFT tools in particular, and to a degree also to modernised cultural heritage in general.

2. AN OUTLINE OF ENVISAGED SHIFT EXHIBITION CASES

In this section we aim to address a set of obstacles that CH institutions often face in regards to digital transformation. The project outcome will be demonstrated with the support of the four CH partners, BMN, SMB-PK, SOM and ANBPR. In the following tables the information presented in the SHIFT DoA regarding specific cases is updated.

2.1. EXHIBITION CASE 1 (EC-1): BALKAN MUSEUM NETWORK /THE HOMELAND MUSEUM OF KNJAŽEVAC

The exhibition will encompass Serbian art from the 19th century and modern times from the collection of the Homeland Museum of Knjaževac.

Opportunities & Motivation

The Balkan Museum Network (BMN) exists to celebrate, preserve and share the complex common heritage of the western Balkans. It is based on mutual respect and guided by a commitment to professionalism and shared ethics. The Network supports innovative pilot storytelling and interpretation projects, as well as projects focused on improvement of access and inclusion through the use of digital and tactile didactic elements enabling multisensory experience for all.

The Homeland Museum of Knjaževac (HMoK), as a member of The Balkan Museum Network and associate partner of the SHIFT project, is focused on development of innovative accessible and inclusive programs, digitalization of collections, their interpretation and presentation, with the main goal to be accessible for all. This complex museum was founded in 1980. And it treasures, researches, presents and interpret cultural heritage of Knjaževac municipality from prehistoric to modern times. It is consisted of three buildings/facilities and one archaeological site. As historical buildings, protected cultural monuments, museum facilities are not completely accessible for visitors in a physical way. That is why the museum sees digitalization process as possible solution for improvement of accessibility and interactive communication between collections and audience in general.

The Museum holds important collections of more than 25.000 objects and artifacts:

of ≥1000 paintings of Serbian contemporary and modern artists, 19th and early 20th century paintings and icons, 21st century graphics made by international artists, with almost 90% digitized;

Collection of more than 2000 archaeological artefacts and objects from prehistoric and antique periods, and Medieval Ages, more than 90%digitized;

>2000 documents, archival material, only 10% digitized;

More than 9.000 photos from the late 19th to the modern times covering customs, wars, people, architecture, historical events, celebrations, cultural and social life, politics, everyday life, more than 80% digitized;

>10000 "digital born" photos covering documentation of the field work, research and events in the museum;

> 25 videos from the 60's to modern times (folklore, customs, everyday life, events, celebrations, etc), 85% digitized.

More than 30 3D models of churches and fortresses (photogrammetry and 3D modelling) in digital format.

The Museum aims to promote its rich collection and make them available in different digital formats online, via platforms and websites, applications and interactive tools. It has an accessible website with audio-video descriptions, sign language interpretations, videos about selected objects and exhibitions with subtitling in at least two languages and sign language interpretations, Android and iOS applications with 3D models, audio-video descriptions, AR and VR elements, tools for text enlargement, tactile archaeological exhibition with legends on Braille, informative legends on Braille and large print, sensory elements, interactive publications and other educational programs that provide interactive and multisensory experience in museum exhibitions and spaces.

Exhibition objectives

- To augment the experience of visitors in the Homeland Museum of Knjaževac, Serbia, with an exhibition focused on the art pieces (paintings, icons from the 19th century, and contemporary Serbian paintings) using innovative digital tools.
- To enhance the richness of the detail within the cultural assets with short-video clips, tactile descriptions, and audio (visual) and tactile elements, for people with sensory impairments and other audience members, providing 'audio captioning' for the short videos and subtitling for deaf or for people with hearing impairments.

- To provide a better support for curators in organizing the exhibition layout/objects in a culturally significant order, with contemporary references.

Barriers to accessibility and inclusion

Due to:

- The limited physical access to museum facilities because of the protected characteristics of cultural monuments;

- The lack of funds for appropriate architectural solutions (ramps, lifts, etc.);

- The lack of qualified digital experts and high expertise to process already digitized CH resources;

- The lack of funds for purchasing technical equipment;

- The Static experience across museum that determines lack of visitors' engagement;

- Existing engaging solutions, such as: touch screens and Android Applications with AR elements and 3D models, QR codes are appealing, but are lacking multitude digital CH content and can be seen as already outdated,

the museum cannot be flexible in initiating different thematic exhibitions to attract visitors.

Proposed innovations/outcomes from SHIFT

Bringing paintings, images, and 2D objects to life, adding third dimension, audio description and providing multisensory experience will help museum attracting visitors in general.

The proposed pilot approach will improve access and inclusion, and create space for more engaging relation with audience.

Multimodal and multisensory experience makes collection more accessible for all, which is an added value of the pilot exhibition and brings innovation, not only to the audience experience, but also to the standard work and functioning of the museum.

Although the main focus of the pilot exhibition is on the improvement of access and inclusion, the most important outcome would be an innovative approach in use of collections and audience development and engagement.

SHIFT will become an essential service and mechanism to The Balkan Museum Network's member The Homeland Museum of Knjaževac, to increase the accessibility and inclusion by "modernizing" and being more up to date with a new and intense solution that create excitement among visitors.

The idea of the exhibition is to create an interactive communication between selected objects and visitors/audience, providing access also, but not only for partially sighted and blind persons using, using different digital tools and digitized content.

This exhibition will be based on selection of paintings, drawings, graphics, icons, posters and photos from the artistic collection of the museum. The working title of the exhibition will be "Pictures speak". Using a digital content and tools, it will provide a possibility to bring two dimensional objects, such as paintings, to life. Each object will have audio description explaining the art works, or recorded narration about the person or event/place presented, customs and objects combined with digital tools and effects such as 3D animation, AR/VR elements, providing multimodal and multisensory access to collection, etc. Added value of the selected approach is that it provides access and inclusion to collection, not only for one target group, but for all, and improves the quality of museum programs, services and work, in general.

This will be achieved by revitalizing existing CH, through testing the following tools:

- Tool to enhance Photos / Paintings to Short Videos (AR, 3D, hologram/matrix elements, etc.), followed by audio descriptions and effects;
- Audio tool – "Video to Speech" capable of interpreting visual stimuli (e.g., actions explained in visual sequences);
- Tool to "Text to Speech" that automatically can provide complementary information regarding the cultural heritage assets, by generating and transforming image to text to speech and image to sound (landscape to soundscape);
- Tool that translates historical meaning into more contemporary language and for auto-tagging/ auto-categorization of cultural heritage resources;
- Events/presentations/workshops that will serve as pilot testing of proposed and possible outcomes.

Novel exhibition with the working title "Pictures speak", based on the selected artifacts form the art collection of the Homeland Museum of Knjaževac, will encompass the following:

- 30 short videos (of up to 2 minutes length, with audio description about selected paintings, drawings, icons and photos that can be supported by Pepper's Ghost element, Face swapping, Photo Booth, with 3D motion effects, etc. depending on the content) available also online or via apps;
- 20 videos about posters and photos, recreating selected important historical or cultural events, with 3D effects, "audio captioning" and subtitling for people with visual and hearing impairments;
- 5 videos and 3D models of sculptures for the art collection, transformed and presented with haptics "sensing" interaction for people with visual impairments
- 1 long video about the exhibition with "audio captioning" and subtitling for people with visual and hearing impairments;
- Printed material both on regular text and in Braille, will be printed, supported by QR codes, enabling user to reach digital content;
- Exhibition will be prepared and advertised on selected communication channels;
- The project outcomes will be presented on conferences and other similar cultural events.

Visitors (segmented by categories), will be invited to evaluate key aspects of their experience in engaging with the exhibition in its various media formats, using prepared questionnaires and semi-structured (recorded) interviews. The questions will be designed to encompass the use of specific SHIFT tools and visitors experience.

2.2. EXHIBITION CASE 2 (EC-2): EXPERIMENTING THE TRANSFORMATION OF MEDICINE AND PHARMACY

Opportunities & Motivation

The MNM Semmelweis Museum of Medical History (SOM) has an impressive collection of medical CH objects collected at the supranational level that is yet unexplored. On one hand, the current permanent exhibition in the 19th-century building basically do not apply any digital solutions to enhance the visitor experience. On the other hand, the SOM preserves 150 paintings covering scenes from the history of medicine, healing, sickness, epidemics, hospitals in past eras, portraits of physicians and pharmacists, of which none are digitized. 55 sculptures and reliefs representing physicians, scientists, or other persons related to medicine and various medical objects are also not digitized. Only a tiny fraction of its 140000

books and 7500 photos are in digital format. Also, there is a considerable collection of 1000 rare videos, out of which 20 are digitized and 4205 meters of black and white film footage covering scientists experiments and interviews.

Furthermore, there are still no applications available for the visually impaired, blind and in other ways disadvantaged visitor groups that could be adjusted for the purposes of a museum with such a special collection. Innovative AI and ML technologies could offer opportunities to this complex problem and make the SOM collection more available to – any - groups of visitors.

Exhibition objectives

Three exhibition projects in the SOM are planned to be launched to test new forms of multisensory experience for a generic and/or diverse visitor groups through economically viable solutions. These exhibitions aim to emerge the visitors into the history of medicine and let them "feel" how different illnesses were treated before modern times. This will be achieved using several tools within the projects. The projects will be presented at the main building of the SOM, which is visited by approx. 20.000 visitors annually, both from Hungary and abroad.

Barriers to accessibility and inclusion

- Static experience across the whole museum for visitors
- Lack of visitors' engagement due to limited immersive content
- No modern, engaging tools exist within the museum (e.g. AR/VR, haptics)
- Dedicated multimodal access solutions for visually impaired and/or disadvantaged visitors are rare and only used in temporary exhibition and usually not reusable
- Most of the objects in the permanent exhibition ordinary understanding and receive attention of the public only by customized narrative enrichment and educational information offerings

Proposed innovations/outcomes from SHIFT

According to the preliminary plans, visitors will be able to "sense" the use of medical devices and can be engaged in the extraordinary evolution of the transformation of medical knowledge, practices and pharmacy issues. An intervention into the permanent exhibition can make it socially, intellectually and sensorially more perceptible for the any groups of the public, or, alternatively, a temporal exhibition titled "Experimenting the transformation of medicine" will be prepared and advertised on selected communication channels and will encompass the following:

1. **"Telediagnosis from the past":** Visitor can talk to a hologram representation of a historic healing person/physician receiving a diagnosis based on their symptoms. Text already available in a digital format will be used from e.g. Europeana.

2. **Animated movie of anatomical pictures:** A selection of pictures depicting operations or anatomical examinations will be animated to represent the processes in an ethical and historically accurate way.

3. **Explanatory visualisation of the human body:** The development of AI, haptic and other technologies will make it possible to display the anatomical "twin" of the visitors' hands or arms to present an interactive anatomical and physiological knowledge on surgical practices in the past.

Further probable outcomes from the project:

- 5 short videos with "audio captioning" for people with visual impairments.
- 10 medical objects transformed into 3D objects used with haptics to mimic the feel of using primitive medical instruments/ procedures.
- Museum curators will be assisted in organizing the exhibition layout/objects in a culturally significant order, with contemporary references by using auto-tagging/ auto-categorization.
- More vivid visitor experience, with more detailed and comprehensible knowledge transfer.
- Higher number of visitors, with a higher percentage of disabled, blind, visually impaired or deaf and hard of hearing visitors.
- Higher engagement of young visitors, students, or less informed visitors.

2.3. EXHIBITION CASE 3 (EC-3): ROMANIAN HISTORY AND CUSTOMS EXPLAINED TO DIGITAL NATIVES

The exhibition will present in an artistic and metaphorical way relevant aspects of Romanian culture and national history.

Opportunities & Motivation

Capitalizing on its extensive network of over 2,800 member libraries, organized in 41 county branches, with national coverage, ANBPR plays an important role in coordinating large-scale activities related to the display of cultural heritage assets at the national level. These libraries own and operate an impressive collection of cultural heritage objects, including heritage paintings exploring historical and

religious themes, a wide range of specialized books and manuscripts covering fields such as history, aesthetics, fine arts, music and theatre in the Romanian, Latin and Paleo-Slavonic language, etc.

In addition, ANBPR member libraries hold an impressive base of historical images in physical and digital format, capturing important Romanian and EU personalities and significant historical events. In addition, libraries in the ANBPR network have rich collections of audio recordings covering a wide range of media, including discs, tapes, magnetic tapes and CDs.

All these resources can be harnessed to pilot various tools and to create remarkable exhibitions that bring to the fore the rich cultural heritage of Romania, as the inexhaustible source of inspiration and creativity for the generations of European citizens born digital.

Exhibition objectives

This exhibition will involve the participation of at least 10 ANBPR Romania member libraries that will share information and exhibits about cultural assets from their collections. The main objective of the pilot exhibition will be to support libraries in creating and renewing the presentation of the exhibition portfolio, so as to make it more accessible and impactful, especially for the generation of European citizens born digital. In order to mobilize member libraries in the public system in Romania, ANBPR will initiate and publicly launch a contest for proposals of ideas, intended to encourage both librarians and users of library services in Romania to share their personal collections of historical photographs that will be the object some short videos circumscribed to the theme of the pilot exhibition.

Barriers to accessibility and inclusion

- The low involvement of visitors in exploring and co-creating the cultural content offered by cultural and creative institutions
- The limited offer of cultural content enriched with the support of technology to make heritage assets more accessible, more attractive and more impactful, such as 3D projections, video mapping solutions, hologram solutions, the fusion of arts in the creation and exhibition of multi-sensory solutions of exposure of the relevant cultural content
- Absence of a uniform set of digitalization standards applicable to all heritage conservation institutions (libraries, museums and archives, etc.)
- Lack of knowledge or lack of access to European & global heritage digitization bases (Europeana, Google Art Project, etc.) for Romanian users

(ordinary consumers of cultural goods, users of cultural services provided by libraries, museums and other cultural and creative institutions)

Proposed innovations/outcomes from SHIFT

The pilot exhibition aims to capitalize on the cultural potential of Romania in terms of "Romanian history and customs explained to digital natives" through the artistic exhibition of photo, audio, video and representative rare books, exposed to the public in an enriched manner with the support of technology.

The existing materials in the ANBPR member libraries related to the Romanian cultural heritage circumscribed by the theme of the exhibition will refer to holidays, customs and rituals and musical folklore. An important component of the exhibition will contain aspects related to artistic crafts, different forms of the word art, choreographic folklore, games for children and youth from the geographical space of Romania, etc.

The pilot exhibition will include defining elements for the Romanian space in terms of the following:

- Musical folklore (ritual-ceremonial repertoires, non-ritual repertoires, musical instruments, etc.)
- Choreographic folklore (on what occasions do Romanians practice folklore, when they dance it, where, when and from whom they learned it, etc.)
- Artistic crafts (folk costumes and ornaments, fabrics, artistic processing of skin and fur, braids, artistic processing of wood, artistic processing of metal, stone, artistic processing of horn and bone, painted eggs, folk masks, etc.
- Traditional food (old recipes, ethnographic meanings)
- Art forms of the word and verbal expressions
- Holidays, customs and rituals regarding: calendar customs, customs that mark traditional occupations, customs related to human life, beliefs and legends related to the set of traditional customs, divinatory practices, etc.

Through the multimedia exhibition, historical and rare books will take on another dimension and become more accessible and understandable to a wider community.

The curators of the exhibition will be assisted in the organization and curation of the cultural assets and in the management of all aspects of the graphic and technical display of the exhibition objects, so that this exhibition is culturally, artistically and technologically relevant for digitally born European citizens.

The SHIFT project's pilot exhibition on Romanian history and customs for digital natives takes an innovative approach, combining books, photographs, and

technological solutions. The exhibition aims to make Romanian history and customs more accessible and engaging for modern audiences, with a wide range of digital tools and means/solutions.

The exhibition will feature, but will not be limited to:

> 70 short videos showcasing paintings and photos from libraries or shared by citizens

> 50 books compiling complementary information from online sources. These resources will be accessible through multiple digital platforms, including mobile, tablet, and MP3 devices

> 100 books with historical significance will be translated into a more contemporary language, enabling visitors to create correlations and associations between archaic and modern language, and to delve deeper into the information stored in historical archives

> 5 reference events from Romanian history, presented through pre-existing and newly generated digital content, to provide visitors with insights into the cultural significance of these events and their relationship with human experiences and societal values observed by communities

Overall, the SHIFT project's pilot exhibition represents an innovative approach to showcasing Romania's rich cultural heritage in a way that resonates with today's digital natives.

2.4. EXHIBITION CASE 4 (EC-4): CH EXHIBITION AS VISITORS' JOURNEYS, WITH NO SENSING BOUNDARIES

Opportunities & Motivation

The SMB Museums (Staatliche Museen zu Berlin - Preußischer Kulturbesitz) are partially well positioned to use ordinary digital media channels to reach their audiences online, e.g. social media, and offline within the museums. Audio guides are a standard and usually designed for many exhibitions. Panoramic video tours even in high definition guide the visitors on their home screens through the collections.

Nevertheless, for many exhibitions there are still none or still clearly insufficient applications for visually impaired, blind and disadvantaged visitor groups. We

recognize a distinct lack of multimodal applications that would, for example, make haptic components of a work tangible, render the pictorial representation in appropriate words, or render the mood and atmosphere of a landscape painting acoustically into a soundscape. Innovative AI and ML technologies focusing on computer vision, speech-image-sound recognition, augmented reality and natural language processing offer opportunities to bridge this gap in a sustainable and economically promising way. Thus, multimodal access by innovative information technologies is proving to be our medium of choice to meet the growing importance of barrier-free information offerings and to improve the museum's experience for a large and significant number of blind and visually impaired people (VIPs).

At the same time and with the same strategy, the museums will increase their outreach and attractiveness for the generic visitor, who gains new multi-perspective views and participatory approaches to the collections.

Exhibition objectives

Three exhibition projects in the SMB-PK collections are piloting and testing new forms of multisensory experience to better include visually impaired and blind audiences and at the same time achieve an attractive and multi-perspective narration for generic and/or diverse visitor groups. Of paramount importance here is to reduce curatorial and educational efforts of museum's staff by using innovative AI and ML technologies with the purpose to generate and enrich the CH-content. The pilot settings target at reusable and economically viable solutions.

The exhibition projects will be presented on Museum Island at the Pergamon Museum (approx. 800,000 visits annually), the Old National Gallery (approx. 600,000 visits) and in the Gemäldegalerie (Gallery of Old Masters) at the Kulturforum (approx. 350,000 visits annually).

Barriers to accessibility and inclusion

- Dedicated multimodal access solutions for visually impaired and/or disadvantaged visitors are rare and are regularly used only in short-term programs;
- Support and access for visually impaired and/or disadvantaged visitors are developed for individual exhibitions only, rarely reusable, and economically expensive;
- No automated tools for generating haptic, emotional or narrative address of divers visitor groups;
- Augmented Reality, Museum's Virtual Guides, Virtual Reality Interaction, 3D projections and Semantic Storytelling currently based on 1:1 translation of

cultural content. Innovative AI-based solutions aim at generating new narrations (digital storytelling) and transforming the content;

- Many of the objects in the collection are beyond today's ordinary understanding and receive attention of the public only by customized narrative enrichment and educational information offerings.

Proposed innovations/outcomes from SHIFT

Innovative, multisensory applications for people with visual impairments boost participation and inclusion at museum expositions and events. At the same time multimodal access enriches the experience of generic audiences. The transformation of the content makes the museum even more attractive to a broader public and encourages to perceive new perspectives on the objects in the collections.

The use of AI- and ML-based techniques in the transformation of content (e.g. text to speech, image to sound, digital storytelling) facilitates the work of curators and exhibition guides and reduces efforts and costs.

The reusability of the tools in the museums or even in the creative industries proves to be market-driven and economically feasible.

The SHIFT outcomes:

The exhibition projects of the SMB-PK will develop innovative techniques of multimodal access to the collection objects. Thereby, the consideration of barrier-free and inclusive access for VIPs is in the foreground. The tools that are developed are always considered from the point of view of economic efficiency and sustainable reusability in other contexts:

(1) One or two **3D tactile models** on a scale of 1:25 (or approx.) from large-scale objects will be printed or casted from existing digital 3D models in the collection's repository.

(2) The tactile model is used as a **haptic interface**. It also links via touchable hotspots to written articles and/or audible narration of the scenes depicted from ancient mythology.

(3) If technically feasible, the same tactile model can serve a "seeing" audience interacting with the frieze by **Remote Eye-Tracking systems**.

(4) > 25 landscape/cityscape-paintings will be transformed into soundscape-echoes and enriched with sonic atmospheres. Digital storytelling and emotional visitor's journey.

(5) > 25 paintings of the Gallery of Old Masters will be deciphered and described **automatically by complementary information from ICONCLASS and online sources.** Image to text to speech to make them more accessible for VIPs, visitors and curators.

(6) A tool for **evaluating the effectiveness** and success/failure within the use case exhibitions.

(7) > 3 **reference events** to promote and popularize the SHIFT tools to the various communities in engineering, administration, curation, and outreach.

3. FOUNDATION AND SCOPE

This section of the deliverable lays down and discusses the foundation for and scope of the framework in which the SHIFT project operates and to which it must accommodate. On the one hand, this applies to the technology the SHIFT tools themselves employ or on which they are in turn deployed on. On the other hand, this consequently needs to take into account already existing standards and best practice models concerning accessibility and inclusion as a foundation to build upon and contribute to.

3.1. APPLICABLE TECHNOLOGY

Since "SHIFT" is strategically conceived to deliver a set of loosely coupled, technological tools" [9], it is consequently conceivable that they apply to and might be deployed on a wide range of platforms and devices at least hypothetically, until stakeholder requirements become clearer and development proceeds accordingly. This is relevant in light of the partially fragmented field of available standards and best practice recommendations addressing accessibility and related issues both in general terms and in terms specific to the respective technology.

The technologies comprising the SHIFT tools aim at expanding the inclusivity of CH organizations, embracing in more efficient ways the individuals in the risk of exclusion, such as people with sensory disabilities like visual impairments, and entice new audiences such as the younger generation. In summary the SHIFT tools are:

- **Image to Video**: tool to enhance photos / paintings to short videos

- **Video to Speech**: audio tool capable of interpreting visual stimuli (e.g., actions explained in visual sequences)

- **Haptic Interaction**: tool that translates physical objects to digital objects and use haptics to "feel" the objects. To implement haptic interaction with 3D digital tangible and intangible cultural heritage assets, augmenting the Users Experience (UX) with new interaction paradigms that can be used in situ or remotely

- **Audio Narrative**: tool that automatically can provide complementary information regarding the cultural heritage assets (books, paintings, photos)

- **Contemporary Translation**: tool that translates historical meaning into more contemporary language and for auto-tagging/auto-categorization of cultural heritage resources

- **Accessibility Framework**: comprehensive, intuitive and accessible tool for all (including individuals with disabilities) multimodal storytelling of cultural heritage assets

- **Accessible Text-to-Speech (TTS)**: tool for people with visual impairments that will read content originating form book resources, descriptions of photos/paintings from curators

SHIFT tools will be used not only by cultural heritage end users (e.g., visitors, internet users) within or outside of a CH institution, so that they can experience CH assets more effectively, but also by cultural heritage professionals, such as curators, to better manage CH assets for creating new or revamping existing CH asset exhibitions, librarians and archivists to better organize the collections, or historians to provide comprehensive descriptions to alternative visitors' groups, etc.

The following table summarizes how, where and who will be using the SHIFT tools.

Table 1 How, where and by whom SHIFT tools will be used.

SHIFT tools	Exhibition Cases	Devices	Stakeholders
Image to Video	EC1, EC2, EC3	Device independent	• end users • CH professionals
Video to Speech	EC1, EC2	Device independent	• end users
Haptic Interaction	EC2, EC4	Haptic devices	• end users
Audio Narrative	EC1, EC2, EC3	Device independent	• end users
Contemporary Translation	EC1, EC3, EC4	Device independent	• CH professionals
Accessibility Framework	EC3, EC4	Extended Reality (XR) devices	• end users

Accessible TTS	EC4	Device independent	• end users

3.1.1 DEVICE-INDEPENDENT APPLICATIONS

Most of the SHIFT tools can be regarded as primarily or purely software-based solutions. This enables functionality largely independent from individual hardware solutions, i.e. across multiple platforms. In turn, this requires the identification of the potential spectrum of solutions which might be used in practice, and appropriate UI design and adaptations to facilitate maximum inclusivity across the board, not just for visitors but also for CH personnel. Once identified as a baseline for universal design, the development of tools can consider flexible interfaces to reach the widest base of users with a minimum of specific requirements from the user side.

As per Table 1 the device-independent SHIFT tools are "Image to Video", "Video to Speech", "Audio Narrative", "Accessible TTS" and "Contemporary Translation". All these tools can be deployed in any type of device that provide display and/or audio output since the main interaction modality is human sight or hearing. Particularly, the output of "Image to Video" can be visualized in any type of display, that can either be installed in the CH institutions, e.g., laterally to the pertinent artifact or exist at any other place, e.g., users' office, home, etc. Furthermore, the size of the displays can also vary from small mobile screens to big wall displays.

Similarly, the hearing related tools "Video to Speech", "Audio Narrative", "Accessible TTS", can be installed in any type of device that bears audio output (e.g., speakers, headphones). To that end, these tools can be deployed either at the CH institutions, providing auditory cues to the visitors, or in any desktop, portable, or mobile computational device that users can utilize either in specific places, e.g., their homes, offices, etc., or on the move. The same principles hold for "Contemporary Translation" in general, although this tool generates textual information, it can mainly be used as an intermediate content generator, which provides descriptions that are very useful to heritage professionals, e.g., historians, curators, etc., for producing contemporary translations of CH assets, clustering relevant content, or creating coherent exhibitions. To that end, this tool can run on any type of computational devices, including desktop PCs, laptops or tablets.

In terms of digital accessibility requirements, the output of the "Image to Video", "Video to Speech", "Audio Narrative", and "Accessible TTS" tools, constituting time-based media, should comply at the minimum with the W3C's Web Content Accessibility Guidelines v2.1 (WCAG 2.1), that adhere to time-based media content (Guideline 1.2). Similarly, the "Contemporary Translation" tool should also comply with WCAG 2.1, specifically it should be distinguishable (Guideline 1.4) and readable (Guideline 3.1).

It should be noted, that since SHIFT was founded on the roots of universal access, it has already considered the needs of specific groups, such as the individuals with visual impairments that are addressed in the project, and already foresaw providing all the necessary assistive technologies that these people will need to have access to the content (e.g., text to speech, haptic feedback, etc.) through the SHIFT tools.

3.1.2 DEVICE-SPECIFIC IMPLEMENTATIONS

While the above-mentioned SHIFT tools will work without demanding any particular device or technology supporting their interaction with the end-users, others have a more particular interaction, which needs to be catered to by specific types of devices. This means, in the context of accessibility and inclusion, that the tools despite efforts toward universal design need to take into account specific hardware and potentially intermediary custom software solutions running on it, that serve as the front-end for the user.

As already mentioned in the previous section, most of the SHIFT tools are theoretically device independent, in the sense that they can be accommodated without needing any particular device or extra assistive solution. However, two of the SHIFT tools, namely "Haptic Interaction" and "Accessibility framework", demand specific devices to be worn by the users. "Haptic Interaction" needs a haptic device, so as to reproduce multi-properties of tangible CH assets by generating on the users' hands haptic stimuli, like forces, vibration, and temperature. On the other hand, the "Accessibility Framework" harnesses all the other SHIFT tools in on solution, aiming to address each different SHIFT target user groups' needs in a personalized way. To that end, the best way of achieving that is to be deployed on XR devices (e.g., AR glasses, tablets, or VR headsets), combined with haptic devices, so as to easily augment users' reality with complementary information cues.

Different standards as well as practicalities may apply to different areas of accessibility (i.e. distinguish between intellectual, physical, or sensory disabilities, which in turn are further distinguished between visual and hearing impairments, etc.) as well as distinguish between types of devices, for instance personal devices (e.g. smartphones owned by visitors) as opposed to institution-owned portable multi-purpose hardware (e.g. headphones, AR glasses) or stationary hardware (e.g. touchscreens, haptic installations). XR, for instance, might imply all three.

In order to safeguard the digital accessibility of the SHIFT tools, relevant standards will be considered (see next subsection), as well as specific criteria and guidelines which are detailed in section 5.1.

3.2. RELEVANT STANDARDS

The above consideration of a diversity of solutions, software and hardware, necessitates a survey and evaluation of existing standards and best practice recommendations covering them, conducted in the following section. There are multiple international standards which operate on different levels of prominence, some have been formulated into European directives and law, some are recommendation designed by industry representatives to enhance the experience for users with disabilities primarily for their own products, customers, and ultimately brand recognition. Therefore, some of the standards overlap to considerable degree, while others partially compete. A different issue to consider is their legal status; although the adaptation of aspects of standards into EU law reinforces them into legally binding obligations, others only offer a seal of approval by the maintaining organisation if they are even aware of the implementation; in other cases, implementation is neither enforced nor supervised, only offering frameworks and guidelines adherents subsequently can claim compliance with.

3.2.1 SURVEY OF STANDARDS

The following overview surveys key international players relevant in the European context for their establishing of standards or larger frameworks for accessibility and inclusion, including specific texts potentially relevant to for the project, as well as a brief glimpse at some corporate forays into the field.

UN Convention on the Rights of Persons with Disabilities

Largest exposure in global terms must be attributed to the UN Convention on the Rights of Persons with Disabilities (CRPD) and its Optional Protocol (OP), which were adopted on 13 December 2006 and entered into effect on 3 May 2008, as the first comprehensive human rights treaty of the 21st century. As per the UN Human Rights Data Dashboard last updated in February 2023 [10], 186 countries have ratified the convention with 8 (including the USA) still not having surpassed the signatory stage and 4 countries remaining apart. The data for the optional protocol reads 104 as state party, 24 as signatory, and 70 without action. Within the convention document, of particular interest for the context of the SHIFT project are Article 9: Accessibility, and Article 30: Participation in cultural life, recreation, leisure and sport. [11]

EU Web Accessibility Directive and the European Accessibility Act

Less general and impactful on a global scale but closer to the context of the SHIFT project as well as more specific to it are accessibility measures brought underway by the EU. These prominently include the EU Web Accessibility Directive and the European Accessibility Act. The Web Accessibility Directive (or WAD), [Directive (EU) 2016/2102] was adopted 22 December 2016 and regulates the facilitation of access for people with disabilities to websites and mobile apps of public services [12]. It has been reshaped by related implementing decisions establishing the model accessibility statement (2018/1523), establishing monitoring methodology and arrangements for reporting (2018/1524), as well as a harmonised standard for websites and mobile application (2018/2048 updated by 2021/1339). The current technical standard is EN 301 549 V3.2.1, 'Accessibility requirements for ICT products and services', the latest version of (2021-03) has become the sole relevant standard on 12 February 2022 [13]. Of particular interest are chapter 5 (generic requirements) and chapter 7 (ICTs with video capabilities), as well as the corresponding Annex C.5 and C.7. [14]

The second major and slightly more recent measure is the European Accessibility Act (or EAA) [Directive (EU) 2019/882] of 17 April 2019 concerning the accessibility requirements for products and services [15]. It expands the scope to business contexts rather than only the public service as the WAD. Of interest here, Annex 1 lists detailed requirements for various products and services [16]. One of the concerns with the EAA is the still transitory status of some of its repercussions and effects with a timeline stretching years into the future till changes must have been implemented by the industry for certain types of products.

ISO Norms and Standards

Another major and long-established source for norms and guidelines is the International Organization for Standardization (ISO) founded in 1947 and based in Geneve. Although much broader in scope and offering standards for nearly everything technical from manual tools to norms for office architecture, including their classification and processes, the ISO consequently has a number of (sub) committees and working groups that cover accessibility issues and assistive technology. Due to the rather specific clusters of areas to which individual ISO norms apply and the strictly regimented use of their documentation (i.e. copyright), this paragraph will only list a number of prospective norms which will have to be validated and integrated into the SHIFT Project as their usefulness as well as necessity becomes apparent during the development of SHIFT tools. These prospective norms and standards are:

ISO/IEC Guide 71:2014 "Guide for addressing accessibility in standards" (2nd ed. 2014, reviewed and confirmed 2021), which provides guidance to standards developers on addressing accessibility requirements and recommendations in standards [17]. This is complimented by ISO/TR 22411:2021 "Ergonomics data for use in the application of ISO/IEC Guide 71:2014", provides quantitative data and knowledge as well as context-specific and task-specific data [18]. Both texts together basically provide a meta-standard on how to deal with accessibility in the context of other standards.

Another 'standard' touching on accessibility is the cluster of the ISO 9241 series, a multi-part standard concerned with ergonomics and human-computer or human-system interaction. As the title suggests, the scope is rather broad and by now incorporates multiple standards that previously ran individually under different numbers (now withdrawn), which can add further to a convoluted and confusing impression of the scheme. Nevertheless, a few parts stand out with nominal relevance to accessibility. These are: ISO 9241-20:2021 "Ergonomics of human-system interaction — Part 20: An ergonomic approach to accessibility within the ISO 9241 series"; ISO 9241-171:2008 "Ergonomics of human-system interaction — Part 171: Guidance on software accessibility"; ISO 9241-971:2020 "Ergonomics of human-system interaction — Part 971: Accessibility of tactile/haptic interactive systems".

Next is a more loosely connected collection of standards that can be expanded at will to demonstrate the dedication of the ISO to accessibility across a wide

spectrum[3], but of which a special position must be awarded to where it comes to the context of cultural heritage, an area less extensively dealt with hitherto. Some of this even is still under development, for instance, ISO/CD 5727 "Accessibility and usability of the built environment — Accessibility of immovable cultural heritage — General criteria and methodology for interventions [still under development]. Referring to the context of tourism, there are ISO 14785:2014 – "Tourist information offices – Tourist information and reception services – Requirements" [reviewed and confirmed 2019]and lastly ISO 21902:2021 "Tourism and related services – Accessible tourism for all – Requirements and recommendations". As the listing shows quite a few of the standards are adjacent to areas of interest, if for instance a museum or cultural heritage site is a cultural tourism location (and as such covered by ISO 21902:2021), but the value of these standards has yet to be determined and until then other, more user-friendly and indeed accessible standards will be favoured as long as sufficient.

World Wide Web Consortium (W3C)

A non-governmental source specialising in standards concerning primarily web content is the World Wide Web Consortium (W3C). Its main contribution to relevant standards in the context of the project are the Web Content Accessibility Guidelines (WCAG) [19]. The current version is WCAG 2.1 (since 2018), while a WCAG 2.2 draft is scheduled to be finalized in early 2023 and WCAG 3 is already on the horizon. This being said and considering the multimodality of SHIFT tools, it needs to be pointed out that the W3C also works on related non-web digital content projects, such as "Guidance on Applying WCAG 2.0 to Non-Web Information and Communications Technologies (WCAG2ICT)" [20], as well as evaluation standards (Accessibility Conformance Testing (ACT)) and (Evaluation and Report Language (EARL)). Of particular interest to the project is their venture

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[3] ISO 23599:2019 "Assistive products for blind and vision-impaired persons — Tactile walking surface indicators" [Note: may not be applicable in countries that have adopted and legalised competing standards]; ISO 17049:2013 "Accessible design – Application of braille on signage, equipment and appliances" [reviewed and confirmed 2019]; ISO/TS 21054:2020 "Ergonomics — Accessible design — Controls of consumer products"; ISO 24503:2011 "Ergonomics — Accessible design — Tactile dots and bars on consumer products"; ISO 24508:2019 "Ergonomics — Accessible design — Guidelines for designing tactile symbols and characters"; ISO 24509:2019 "Ergonomics — Accessible design — A method for estimating minimum legible font size for people at any age"; ISO 24550:2019 "Ergonomics — Accessible design — Indicator lights on consumer products"; ISO 24551:2019 "Ergonomics — Accessible design — Spoken instructions of consumer products"; ISO 24552:2020 "Ergonomics — Accessible design — Accessibility of information presented on visual displays of small consumer products"; ISO 17069:2020 "Accessible design — Consideration and assistive products for accessible meeting", ISO 19029:2016 "Accessible design — Auditory guiding signals in public facilities"; ISO/IEC TS 20071-21:2015 "Information technology — User interface component accessibility — Part 21: Guidance on audio descriptions"

into W3C XR Accessibility User Requirements [21], which along with the WCAG will be outlined in more detail below in section 5.1.1.

Miscellany and Corporate

One more guideline concerned with the same burgeoning special interest field of XR is the XR Association Developers Guide, by an industry-wide collaboration whose "members represent the headset and technology manufacturers across the broad XR industry, including Google, HTC Vive, Facebook and Oculus, Microsoft, and Sony Interactive Entertainment" [22]. One noticeable difference of this document comparative to the extensive guidelines offered by the W3C is the relative brevity and vagueness of what sometimes reads more like tips than obligatory recommendations, raising the question for whom these guidelines are to benefit from. Put differently, who it is to gain most, industry or customers, which directly connects to the next more general point when it comes to individual industry actors rather than associations.

In regard to corporate players, it must be positively noted that practically all of the major players in Big Tech such as Apple, Microsoft, and Google, by now have recognised a need and continuously work to implement and further develop accessibility tools in their platforms and even hardware with specifically marketed accessibility toolkits, adaptive controllers, and even options for custom designs via 3D printing. Tools particularly useful for the blind and visually impaired, such as UI adaptation for font size and contrast, TTS engines, and voice assistants, which years ago required expensive specialised third-party solutions, are now routinely baked into operating systems. While of course commendable and indeed a godsend for many of the users with disabilities, things must unfortunately also be viewed with a bit of cynical scepticism. Implemented standards as well as guidelines occasionally published by such corporate entities, e.g. recently released guidelines for "inclusive design – cognitive exclusion" [23]; are just as much PR exercises in branding themselves as inclusive company than attracting developers to their systems and design principles, which then are almost mockingly ignored by their other development departments when they consistently introduce and enforce design choices that obviously have not been thought through at all[4], and worse still, remove choices in customization – a freedom absolutely critical to the disabled precisely because the "one size fits all" approach indeed does not fit all in a diverse world, a situation no amount of automation will change. Moreover, the fact that

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[4] E.g., the "modern comments" mess mobilised numerous commentator from professional fileds such as editors, educators, writers, academics, who criticised in detailed feedback the many failings of the redesign, including those of accessibility – screen readers inability to see the comments, etc. Dee MS Tech Community: https://techcommunity.microsoft.com/t5/microsoft-365-blog/introducing-modern-comments-in-microsoft-word/ba-p/2263182

ulterior motives are at play becomes painfully evident when accessibility tools are designed to keep customers bound to the brand and in walled gardens or drive them into its (advertisement) ecosystem. And finally, there is always the threat of services people have grown accustomed to and come to rely on simply being discontinued for a perceived lack of enough general interest by the general public (which translates to economic promise), but which is devastating for those who have significantly higher barriers to constantly (re)adapt on a whim[5].

3.2.2 FORMAL REQUIREMENTS FOR THE PROJECT

In light of the variety of partially overlapping, but occasionally also directly competing standards, it must additionally be considered that there are formal requirements as set by the original Description of the Action (DoA part B) of the grant agreement for this EU-funded project to be satisfied. This obviously is in addition to any requirements which formally apply through the framework of EU legislation such as the EU Web Accessibility Directive and the EU Disability Act, the compliance to which is a matter of course, and instead should ensure the aptness of SHIFT specifically. In particular, SHIFT Objective SO7 requires: "Participation in at least three (3) different standards organisations / At least five (5) input and output contributions to different standards organisations / SHIFT tools compliance to at least three (3) international accessibility standards". This circumstance invites early planning at this stage to fulfil requirements already in the context of individual components the project as opposed to overall, if possible.

3.2.3 DISCUSSION: PROGRESS, GAPS, GOALS

As the above survey shows, accessibility and thus inclusion are a concern increasingly on the mind of the public consciousness. Considerable progress has been made over the last decades on the technological as well as on the socio-political front, reflected in legislative action and legal enforcement as well as in voluntary standards devised by organisations, industries and markets to promote an ideal from which they stand to benefit in various ways: increases in numbers of potential consumer to reach, positive brand recognition, or even a certain reliability and flexibility offered by shared standards in a given field. However,

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[5] E.g. Google is notorious for simply discarding products but even Microsoft has abandoned its own mobile platform Windows Phone/Mobile, effectively rendering these tools basically useless at short notice.

reviewing the multitude of available standards also reveals a degree of disconnect, not so much between standards that in principle are simultaneously complementary and competing, but a disconnect between the areas they cover.

On the one hand, the ISO portfolio for instance offers a vast number of standards concerned with accessibility one way or the other in the context of physical barriers or sensory impairment in the physical world, some dealing individually with very specific aspects, some more general within other areas of concern where physical accessibility plays a role. On the other hand, a multiplicity of standards has sprung up dealing with media and barriers in content, from traditional media in print or audio-visual recording and broadcast to new digital media, the modern web and XR. That the latter are in more abundance than the former may be testament to the dwindling role the 'traditional' media play in today's cultural context and the relatively recent increase in focus on accessibility.

This brings up the question which place culture and cultural artefacts that even predate the modern media landscape still hold or rather can take up in the push for accessibility. Without going so far as to dismiss cultural heritage and conservation as a niche concern, it appears that this specific cultural sector is oddly positioned within the system of standards in a liminal role. It is noteworthy how ISO 21902:2021, one of the few standards that explicitly deals with cultural heritage in the context of cultural tourism, considers museums primarily as physical environments with corresponding physical barriers to be addressed. While "[t]echnological resources should be offered, such as audio guides and video guides that are also accessible with regard to their manner and operation and their communication resources with audio description, closed captions and sign language, where appropriate", this is then not further specified or developed. Instead, it is simply stated that "[t]he development of ICTs, informational panels, interactive screens and internet applications (e.g. IR, NFC, two-dimensional codes such as QR codes) should be equally accessible to all people and should conform to the technical requirements of ISO 9241-20 and EN 301549", thus deferring to entirely different standards wholly concerned with modern media. In turn, EN 301549 refers to culture only in the vaguest sense as "environment", which "in a context of use includes the technical, physical, social, cultural and organizational environments", but establishes not much connection between environment and ICT beyond negative disruptive factors and barriers (e.g. noisy environment or awkwardly placed devices).

Although the view in ISO 21902:2021 of museum buildings as primarily physical environments can hardly be disputed, the treatment of modern media and technology within and integrated into this context is lacking. While it could be

argued that, strictly speaking, cultural artefacts once digitized become digital content, this neglects the specific context of the museum in which the digital content does not necessarily replace the object but interacts with it to enhance its experience. In the context of an exhibition, technology does not displace the exhibit but can be used to augment it, or indeed to facilitate accessibility by means that would otherwise be impossible or prohibitively costly. Other applications may be made only possible by such as the call for good lighting, high contrasts between background and exhibit, and the ability to get close up for view or touch – a lateral presentation of the object on a complementary multimedia tablet (installed or provided) could go beyond these requirements by offering, not only zoom, but also viewing modes for impairments such as colour-blindness, or the ability to switch to audio description, all within the presence of the actual artefact.

On a much more pragmatic level, it must be added that the situation of cultural heritage institutions within the standards is not only complicated by their liminal status, but also by the constant deferral between different standards in technological and digital contexts that are not necessarily the traditional area of expertise of cultural heritage professionals trained traditionally. While this interconnectedness of the standards is in principle a positive thing, particularly within the same field such as web, where the standards of ISO, W3C/WIA, and EN 301549 frequently cross-reference and thus reinforce a shared baseline, it also makes the topic as a whole harder to access. What is desirable, therefore, is the development of a standard or at least guidelines which compound and cohesively outline and thus facilitate more easily the metamorphosis of cultural heritage to adapt to current technological possibilities.

Given the above considerations and their implications touched on throughout the chapter, the most sensible approach is to work with and incorporate aspects of multiple standards where and as appropriate, taking EU law as the baseline and expanding on it with the established duo of W3C/WIA and ISO while avoiding getting attached to corporate interests that may change on a whim. This is further justified by the fact that the EU and W3C have been closely cooperating, with various WIA projects funded by the EU and conversely the latter heavily integrating the WCAG in its technical standards such as EN 301 549. While EN 301 549 is in some instances stricter than the WCAG and therefore both the baseline and ultimate point of reference, it is nevertheless sensible to close follow the WCAG considering already announced and outlined update timeline as well as branching out into non-web content areas in order to keep up with the rapid technical development at the cutting edge this project sees itself part of.

4. STAKEHOLDER USER REQUIREMENTS

In order to define and then refine the scope and specifics of the tools developed by the SHIFT project, it is necessary to take into account the stakeholder user requirements for them. This section outlines who the stakeholders are, the group-specific aspects concerned, expert experience from already conducted use cases, preliminary empirical data from within the cultural sector, and plans for subsequent data collection on end users.

4.1 BRIEF BREAKDOWN OF STAKEHOLDERS

The nature and scope of the SHIFT Project necessitates a differentiated understanding of its stakeholders in order to identify and align or juxtapose their specific needs and user requirements in a variety of contexts. Of equal importance will be a distinction between stakeholders and users – while intended users are in a sense stakeholders, the reverse is less obvious. Nominally, project stakeholders include

Leaders of Cultural Institutions; specialists in Cultural Heritage; digital Content creators and entertainment; Haptics Industry; Academic Community and Researchers; Governmental Organizations; Non-Governmental Organizations (NGOs); Technological Industry; Policy Makers; End-Users (Regular visitors to ICH services; Current non-users of ICH services); Mass media representatives; International professional associations/federations and related; Partners/project team; Interdisciplinary working groups (in e.g. Artificial Intelligence and Technology; Accessibility; Conservation of Cultural Heritage; Museum Curators and Librarians; Education and Research; Ethics and Legality; projects belonging to the same HORIZON Cluster).

Efforts to provide a nuanced breakdown of stakeholder categories have been fed into the SHIFT Stakeholder Matrix (provided above only as a condensed list in broad strokes as the matrix is dynamic and negotiable at this stage; for current version, see D6.1 Annex 4) and segmentation analysis for the specific group of 'non-visitors' of CH, see below. While the stakeholders envisioned by SHIFT are certainly not limited to CHIs and their visitors (or conversely their non-visitors), whether affected by disabilities or not, but includes all kinds of parties directly or indirectly interested in CH, the focus of this current, revised version of the

deliverable will rest on the aforementioned two categories of what can be considered 'primary' stakeholders and more importantly *users*. The first reason for this focus is to illustrate how diversely the stakeholder types can function and consequently require distinct, target-oriented approaches. The second reason follows the pragmatic rationale that, while the general public in form of non/visitors are ultimately speaking the target audience of the project, i.e. the end-users of SHIFT technologies and the consumers/recipients of CH content, in many instances they will require the prior adaptation through professionals at CHIs as 'intermediary' deployers of SHIFT technologies to acquire, process, transform, curate, and/or mediate their collections and external content for their visitors and thus the public. Consequently, it is absolutely critical to understand the needs and expectations of CH professionals, and equally importantly also their own perception of their visitors' needs and expectations in the first place, before one can hope to reach the latter through the former. This chapter on stakeholder requirements therefore proceeds from CH professionals to the target audience of non/visitors.

4.2   STAKEHOLDER GROUP: CH EXPERTS

In general terms, the SHIFT project identifies four major aspects important to its mission: curation, accessibility, inclusion, and storytelling. Each in turn will be defined and enriched with expert experience from case studies conducted and collected by partners within the project.

4.2.1 CURATION

Curating an exhibition in a way that will be accessible and inclusive for all, means a use of assistive technologies, not only assistive in physical and intellectual, but also in digital sense. An exhibition should have not only interpretative tools, but also other tools such as sensory and digital tools.

Digital technologies have been used for a long period of time to support and assist people in many various spheres of life. In industry, science, education, medicine, etc. and in culture. Nowadays, it is necessary and important to use and apply digital technologies, when curating and preparing the exhibition. The need for this was especially evident and relevant during the pandemic but remains a perpetual

demand to accommodate diverse enjoyment of heritage both in physical and virtual space.

Exhibition curators plan for the usage of DT when creating and exhibition concept as it determines how messages are transmitted and perceived by different audience members. The use of digital technologies will provide the access to the larger audience, new experiences, and additional information, more complex sensory experience that will engage visitors in many different ways. Use of audio/visual elements can provide additional content, explanations, stimulation, but also access for People with Disabilities. Use of QR codes and other devices such as BICONs, NFCs and other "digital triggers" can provide quick and easy access to the content, but also interactivity between exhibition and visitor. Use of DT can create a platform for educational and entertaining programs for wide audience and different target group. Use of DT tools such as 3D models, AR and VR can create a new space for exhibiting, for a new content, and other variety of elements. DT helps putting an object into the wider context. Very often, one can find a complete exhibition based on DT, without objects and material elements, which gives a wider filed of work and freedom in curating, and also can contribute to the preventive protection and sustainable use of heritage. There are interactive screens used, tablets and other smart devices, responsive and sensory elements, holograms, 3D models, 3D projections, photo booth effects, etc. that can be involved in almost any exhibition or cultural program.

Based on results of the questionnaire on CH Expert Stakeholder Requirements regarding Cultural Curation, Accessibility, Inclusion, and Storytelling conducted as the part of the SHIFT D1.1 we can see the more than 50% of professionals use DT, which is still not enough. Usually, main reasons for not using DT are the lack of trained staff in IT, the lack of DT devices and training in their usage and similar, but also financed devoted to the development of the programs and purchasing and maintaining equipment. The results shows that respondents think that the most significant impact and functionality of the use of DT will be in improving access and inclusion, easy use of information and intuitive interaction.

It is important to mention that improving accessibility and inclusion of a program, event, exhibition or space means improvement of overall quality of work of the cultural institution, and that each element, especially digital will be of use for all.

4.2.2 ACCESSIBILITY

The second major aspect, accessibility, is a term that has increasingly become visible and important over the last decades, but despite its popular usage (or because of it) needs a bit more explanation, particularly to identify differences to the not quite synonymous term inclusion. By accessibility, the project understands the enablement of access to content, whether knowledge or entertainment, and services. In other words, it is concerned with overcoming the barriers, frequently technical but also relating to issues of physical (e.g. architecture) or legal nature (e.g. copyright and DRM) that prevent the inclusion of vulnerable groups such as people with disabilities. A number of forerunner best practice examples in the CH context can be provided as examples.

Visual accessibility for the visually impaired

In Romania, there is a growing concern for the integration of knowledge accessibility solutions for visually and hearing-impaired people through assistive applications. In particular, the blind community in Romania has benefited from the involvement of NGOs and innovative start-ups in the design, implementation and patenting of solutions, tools and devices that allow people with visual impairments (low vision or blind) to experience images through touch and sensory stimulation. One of the organizations active in this field is The Urban Development Association, dubbed from the business perspective Access2Accessibility Movement, which operates in Romania under the brand "Imagini Tactile".

The interventions so far in the field of making cultural services accessible for the blind community in Romania have consisted in the design of transformative experiences aimed at bringing people with disabilities closer to valuable heritage objects in an unmediated way that establishes a direct connection between visually impaired people or visually impaired and a multitude of visual and graphic resources (photographic art, illustrations, diagrams, maps, infographics, etc.

The Urban Development Association is recognized for the inclusion in the profile market of the use of the technique of "tactile images" which are able to capture and reproduce based on tactile senses, sound, smell, etc. revelatory life experiences that contribute in a consistent and structured way to the experience of knowledge of a visual nature by sensory means, trying to adequately supplement the support provided by a sighted human assistant. The technology proposed by The Urban Development Association (Tactile images) had a triggering

role in the implementation of innovations in the accessibility of cultural assets for visually impaired people in Romania, contributing to increasing the cognitive and emotional quality of visually impaired people who, experiencing the images tactile, they become much more empowered in deciphering visual experiences by calling on the other senses (tactile, sound, smell) to obtain precise mental images of the explored images even in the absence of a sighted companion.

The operating principle of tactile images

The interactive experience generated by the use of tactile images is based on a mix of elements such as 3D images, Braille transcription of texts and a complex of sensors that, incorporated in the physical space (such as a library, museum, other heritage institution) has the potential to trigger on request the issuance of a personalized narrative type response, which becomes active upon command by touching the visually impaired person. The sensory experience can be improved by adding olfactory sensors that can add more naturalness and depth to the multi-sensory experience.
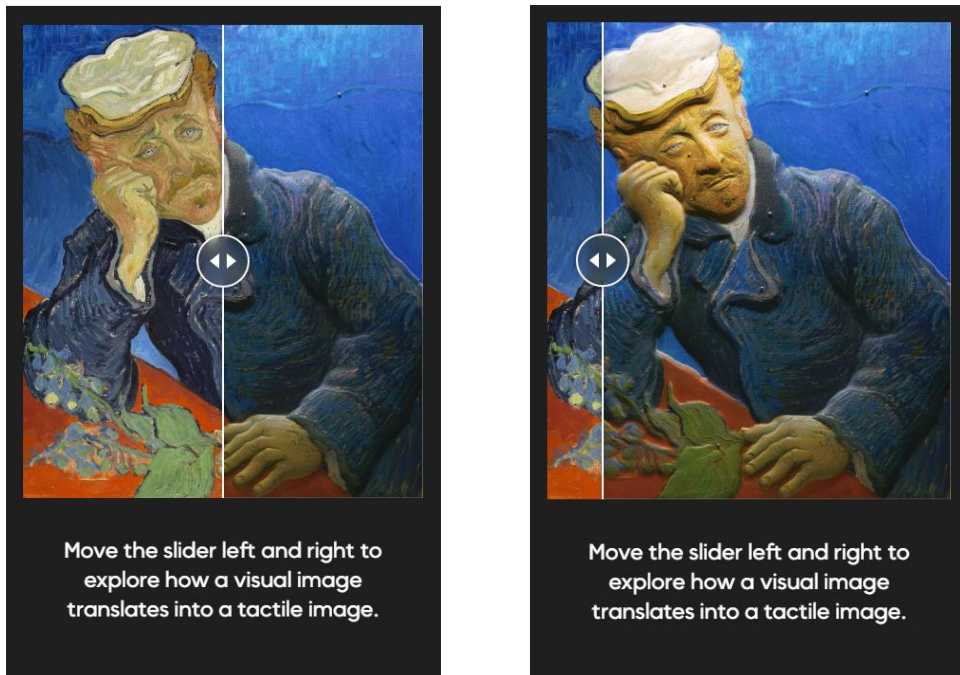
Figure 1. Tactile images

Source: https://www.tactileimages.com/our-impact

Making art accessible by transforming 2D models into 3D, for the visually impaired

A 2D image is transformed into a 3D digital file. Afterwards, the file is digitally sculpted to remove the excess material so that the model acquires the desired shape and texture. After this step, the high-resolution image is printed on top. To the three-dimensional sculpture obtained in this way, several layers of UV protection with hardeners will be added and thus a tactile image sensitive to the touch is obtained.

A variety of layouts can be converted into tactile images sensitive to touch, such as: art exhibits, collages, maps, drawings, photographs, paintings.

Experiences based on kinesthetic learning

The exposure of blind people to qualitative tactile images contributes to their cognitive and sensory stimulation, helping them to create a much more realistic

mental image, filtered through their own senses, without the need for this decryption to happen through intermediaries (sighted people, personal assistant, etc.).

The application of tactile images in the activity of heritage institutions (museums, libraries)

In Romania, the experience of the Museum of Old Maps and Books in making a museum presentation catalogue, intended for the visually impaired, using the tactile image technique, is known as good practice.

Thanks to this tool, the blind can benefit from first-hand information about a series of special old maps from the museum's collection, made by renowned cartographers such as A. Ortelius, G. Mercator, a map of the Danube course, a plan of Bucharest, a map of Greater Romania, etc.
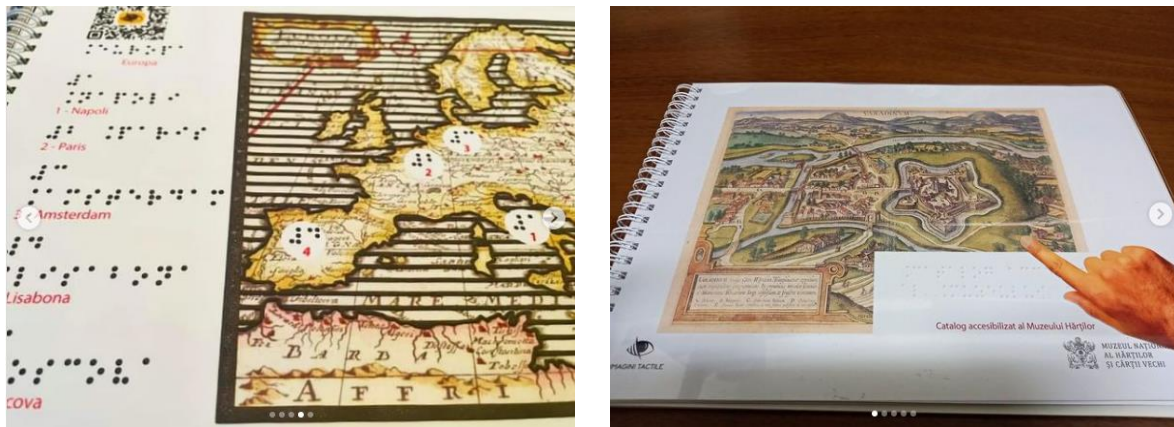
Figure 2 kinestatic learning

Amid of the accessibility lack to cultural goods, ANBPR and libraries in Romania are active in the field of improving the access of people with disabilities to the cultural heritage hosted by cultural and creative institutions. Recently, ANBPR had the role of partner in the project "Vocea noasta conteaza", through which 243 children and young people affected by visual and hearing disabilities benefited in 13 training sessions on the topic of human rights, children's rights, and people with disabilities. 357 young people from mainstream schools participated in 11 educational sessions, during which they interacted directly with disabled people who answered the young people's questions. More than 280 young people from the 7 special schools involved in the project worked in 14 workshops to identify

the social, professional, and educational inclusion barriers they face. The results of these sessions were included in a manifesto that was presented to the members of the Commission for Human Rights, Cults and Minorities in the Romanian Senate, as well as to the relevant local and central authorities. Young people and teachers from the 14 schools involved in the project took part in the actions of the street campaign, by participating in workshops, disseminating materials, and interacting with the citizens of Bucharest, Buzau and Râmnicu Sărat.

During the implementation, ANBPR coordinated the activity dedicated to the creation of digital stories. The project scenario required the visually and hearing-impaired participants involved in the project to learn the Digital Storytelling technique and, under the guidance of two experienced digital story makers, create 50 digital stories that would give voice to personal experiences and exemplify how in which the disability affects their life and the way in which they manage to overcome the barriers assumed by belonging to a vulnerable group.

The stories "Our voice matters!", with the authors themselves being children and young people with visual and hearing impairments from Bucharest, Buzău and Râmnicu Sărat, were included in a Guide entitled Animated stories, storytellers with grace - Guide to digital stories "Ours voice matters!" which will be widely popularized through partners and friends and supporters of the project.

Thanks to the "Our Voice Matters!" project, more than 900 children and young people, both children with visual and hearing impairments from special schools and typical children from mainstream schools, had the opportunity to interact, participate in the project's activities and debate on the rights of visually and hearing-impaired people.

The most popular digital stories created by young storytellers have also been transcribed into Braille to make them accessible to the visually impaired. Beneficiary partners in the project, along with 7 mainstream schools and 7 special schools, were also 4 libraries, namely: the National Library of Romania, the Metropolitan Library of Bucharest, the County Library "V. Voiculescu" Buzau and the Municipal Library "Corneliu Coposu" Râmnicu Salted.

In the light of project implementation experiences, ANBPR considers that there is a need to introduce in libraries and museums reproductions of specially processed works of art so that visually impaired or blind people can explore them sensorially (3D models, bas-relief paintings, art objects with associated bicons to trigger the broadcast of audio narrations, etc.), catalogues and presentation brochures in Braille, tactile carpets, audio guides, virtual assistants, etc.).

4.2.3 INCLUSION

By contrast, the term inclusion shifts the focus on related concerns but a different perspective. If accessibility presents a technical enablement, inclusion concerns more social and psychological aspects. The pure provision of access does not necessarily mean that vulnerable groups are now included, i.e. fully integrated into society or the specific social context and treated as equals, nor does it mean that people with disabilities will automatically want integrate themselves just because they are granted access, when this is still perceived as stigmatising. If accessibility addresses physical and technical barriers, inclusion deals with 'barriers in our heads'. Again, best practice examples will illustrate this.

Review of inclusion methodologies across CH institutions

In the last decades, ANBPR aimed to strengthen the role of libraries as key institutions in the inclusion process by: improving the digital skills of librarians; the elaboration of the standards for the operation of the libraries, the implementation of the "Strategy for the development of Romanian public libraries", the conclusion of strategic collaboration protocols with the public administration; the involvement of libraries in e-Inclusion activities at the European level: European Week of Digital Skills, Digital Agenda for Romania, Digital Education Coalition, Sustainable Romania Coalition, Together in Digital Romania, etc.

ANBPR has established a national training infrastructure in all 41 counties in an effort to train public librarians to help bridge the current urban-rural digital divide.

ANBPR contributed substantially to the e-inclusion of different categories of users and to overcoming the barriers that different human or professional groups at risk of exclusion may face, by:

- Improving skills
- Improving employment prospects or finding jobs
- Increasing the degree of involvement in the community
- Supporting/promoting education
- Improving health and lifestyle

- Reduction of isolation

ANBPR strongly believes that e-inclusion is essential for the future development of Romania and the EU. As a result, ANBPR deals directly with improving the digital skills of librarians, through its own Professional Training and Development Center, thus ensuring the sustainability of the training process of librarians regarding the new library services component. The main focus of ANBPR is currently oriented on the skills and competencies that both library staff and the public must train in order to be adapted to e-inclusion and e-governance processes. In this way, ANBPR has engaged in a long-term partnership with the central and local authorities in Romania and with the libraries in the public system to guarantee that the public libraries will be able to face the challenges of the present and the digital transformation process.

In its effort to introduce new technologies and explain the advantages of the Internet to approximately 11 million inactive online Romanians, ANBPR has created a national training infrastructure, with its own training centres in all 41 county libraries in the ANBPR network, through which more than 3000 librarians have been trained so far, so that they can better serve their communities.

Through the efforts of ANBPR and its partners in Biblionet program, more than 2,600 public libraries have been equipped with ICT equipment, and more than 3,000 librarians have acquired basic IT skills. Contributing to increasing the degree of knowledge and use of modern IT tools, absolutely indispensable for obtaining a job and for increasing the standard of living of the population, ANBPR has created and delivered TOT courses and training in IT skills for librarians and users of information services the library, including the granting of financial facilities for disadvantaged people. In addition, ANBPR, through the system of public libraries and branches in Romania, has long-term popularized the benefits of ICT among members and users of library services.

ANBPR has translated the expertise and knowledge of its members (librarians, experts in various library specializations, trainers, etc.) into modern educational products accessible to both librarians and current users of library services.

Through the training activity of ANBPR, more than 2,000,000 users of library services (approx. 10% of the Romanian population) have benefited from the improvement of their digital skills. Through the ICT courses delivered, through the training sessions of trainers organized at the national level, but also through the development of modern library services with the support of IT technology, ANBPR determined the increase in the degree of digital literacy of the adult population

and contributed to the reduction of the urban-rural gap under the aspect of access to technology.

Also, elderly people, as well as people with limited financial means, benefited from facilities for accessing courses and other forms of career development. Through its 41 county branches and through its professional training offer, ANBPR has oriented librarians' activity towards the training of trainers, in order to multiply the beneficial effects of training at the community level. The librarians trained by ANBPR were involved, in their turn, in the transfer of e-skills to the wider community. Through the efforts of ANBPR and its partners, more than 3000 librarians were trained, more than 100 trainers and more than 50 trainers of trainers were trained, and more than 5000 users were trained in computer skills.

In an innovative approach to the librarian profession, ANBPR wants to transform librarians into true facilitators of knowledge, in accordance with international trends, but also with the specific requirements of employers and the community.

Through its educational projects, ANBPR meets the information needs of users and contributes to the qualitative transformation of society through the use of ICT. In addition, through what it undertakes in the field of training, ANBPR offers both librarians and users an organized framework for continuous learning, as well as the study tools for a quality professional education, with the aim of career development and increasing the quality of life.

In recent years, more and more attention has been paid to e-inclusion policies at European level, as the main premise for personal development, active citizenship, social inclusion and employment opportunities. Public or private Internet access centers (including libraries) play a key role in local societies, especially in small towns and villages, and have become a point of reference not only for new learning technologies, but also for the development of social ties, feelings of belonging to the socio-economic and cultural life of local communities.

According to European statistics approx. 30-40% of European citizens belonging to vulnerable groups (elderly, disabled, women, people with minimal education, unemployed and people living in less developed regions) are not ICT users and therefore not yet part of active part of technology-based society.

In this context, public librarians, as e-facilitators of knowledge, play an essential role in the process of inclusion of disadvantaged groups. They are not only trainers in the field of ICT, but also socio-cultural mediators, as well as the main promoters of the digital inclusion of vulnerable or at-risk users.

In the period 2008-2014, ANBPR implemented, together with its governmental, public and private partners, the Biblionet program, the largest private investment in the technology of libraries in Romania. The Biblionet program, worth a total of 26.9 million USD at the national level, facilitated free access to information for community members, through the development of a system of modern public libraries in Romania. Through the training and technology provided, the Biblionet program has helped libraries to provide services in local communities in the form of a partnership between the IREX Foundation, ANBPR, local and national authorities and libraries in the country. To achieve this goal, Biblionet focused on the following main components:

Facilitating public access to information

Establishing a network of libraries with public access computers (Public Access Centers). Biblionet mainly supported those libraries that prioritized public access to information and demonstrated the willingness to assume part of the costs involved in setting up new centres with public computers and the Internet. Equipping more than 2,600 libraries in Romania with computers through a competitive selection process, Biblionet facilitated free access to information for heterogeneous groups of users from all over Romania.

Training of public librarians

Biblionet partners developed training materials and created a professional training system to help librarians introduce new services and develop innovation in the public library system. The training courses helped librarians become experts themselves in adapting new technologies to the needs of communities.

ICT training courses for librarians

By establishing 41 training centers within county libraries, Biblionet provided the infrastructure and course materials for the use of ICT to the public library system in Romania, so that librarian-trainers, in turn, could better guide the users of the library in using ICT tools.

Promoting the value of libraries to communities

The Biblionet program had an important component of developing the organizational capacity of ANBPR, by creating sustainable operational and organizational structures that could respond to the constantly changing needs of

modern libraries and that would offer relevant services to librarians throughout the country.

Assistance provided to librarians in the development and organization of local content

Through the Biblionet program and through its subsequent initiatives, ANBPR brought together stakeholders from government institutions and at the local level to organize a modern training content that meets the needs of citizens in the fields of culture, education, the labor market, health, economic and rural development, etc.

In recent years, there has been a paradigm shift in the approach to library practice, in the sense that it calls for librarians to focus not so much on inventory systems but, above all, on collaborative systems, resulting in the development of services modern library.

The role of librarians as facilitators thus becomes more and more pronounced, to allow users to interact and create original and co-created content themselves. As is natural, this paradigm shift entails some changes, improvements in the capacities, competences, skills and attitudes of librarians.

Social inclusion is a long-term process, the result of an integrated approach, which coagulates deep internal springs of society. Social inclusion is based on specific mechanisms, such as increasing the chances of development and professional training and facilitating access to resources, such as education and professional training. The development of a social support network at community level, as intended by training e-facilitator librarians in this process, is another mechanism of social inclusion.

The role of the librarian-facilitator for social inclusion:

- provides information and support for disadvantaged or at-risk people;

- identifies the beneficiary's needs and directs him towards accessing the necessary resources to identify appropriate solutions;

- directs the beneficiary belonging to different vulnerable groups to specialized vocational counselling and psychological assistance services, as appropriate;

- develops the beneficiary's ability to act independently in order to achieve the set goal, encouraging the beneficiary's responsibility and engagement in the fight against his social marginalization.

- supports professional integration and/or professional reconversion if the situation calls for this kind of intervention, etc.

One of the ways to achieve social inclusion is counselling for socio-professional integration. In this context, the chances of finding a job for people who do not work are increased. Information and counselling are constituted as a set of services provided free of charge to people looking for a job and aim to:

a) providing information on the labour market and the evolution of occupations.

b) evaluation and self-evaluation of the personality in view of professional orientation.

c) developing the ability and self-confidence of people looking for a job.

d) training in job search methods and techniques.

Professional information and advice, training in job search methods and techniques and presentation at interviews for employment are carried out in specialized centres, organized within employment agencies, as well as in other centres, by suppliers of services from the public or private sector, or by counsellors who work in these institutional contexts.

ANBPR also introduced in public libraries in Romania a set of tools and techniques based on ICT, through which users of library services, belonging to different target groups, including disadvantaged people, became creators of original digital stories on relevant cultural themes. In this way, the public library became, in turn, a central actor in the intercultural dialogue of different segments of the population, including ethnic minorities.

In terms of innovation, through its creative projects, ANBPR offered a modern approach to cultural diversity in an interactive and collaborative manner, inviting participants to share their experiences and cultural values through various means supported by technology, including the Digital Storytelling technique.

After gaining knowledge on using audio-video editing tools, the participants of the ANBPR training sessions gained a range of technological knowledge and skills including promoting their community for personal branding, tourism, etc., which contributed significantly to the long-term sustainability of the ANBPR investment in public libraries and local communities.

Through a creative and innovative approach to cultural diversity, with particular emphasis on the identity of ethnic minorities, ANBPR created between 2014-2016 the portal AgoraCulturală.ro which was and continues to be a multidisciplinary

portal for preserving the cultural specificities of ethnic groups that coexist in the Romanian space.

Thanks to the Agora Culturala @ Biblioteca Ta project, the library, as the main link and carrier of messages to the general public, has become an important vector in the exchange of cultural knowledge, with great benefits for consumers of culture and cultural education in general, including heritage issues cultural.

By developing and disseminating the collections of digital stories produced within the project Agora Culturala @ Biblioteca Ta, the libraries involved have significantly contributed to increasing the taste for culture and the involvement of community members in urban and rural socio-cultural life by stimulating creativity, individual expression and the development of personal skills.

By creating a cultural emulation space at the public library, the Agora Cultural @ Biblioteca Ta project generated a massive cultural movement in the spirit of attracting young people and adults to culture, art, community participation and culturally inspired activities.

Also, through special attention paid to structured learning and sessions guided by certified trainers, librarians and mentors in the arts, the Cultural Agora project contributed to supporting the intellectual formation of children, young people and adults through several pro-culture activities, supported by technology, thus stimulating different categories of the public to participate in numerous activities with an important cultural component.

4.2.4 STORYTELLING

Storytelling via speech synthesis has a strong potential for enhancing museum and library exhibitions offering visitors an unforgettable and immersive experience. Auditory cues, such as speech, have the additional ability to convey complex emotions that may be difficult to express through words alone. To create an enjoyable and impactful storytelling the quality of speech synthesis is of paramount importance. The work conducted in WP3 will provide us the ability to narrate a story with an apt level of speech quality.

Natural Language Processing (NLP) is a branch of AI that involves the analysis of human language. NLP can be used to generate compelling and engaging stories from cultural assets and render monotonous textual descriptions into captivating stories. This is particularly important for people with visual impairments and

younger generations who may find traditional text-based exhibits challenging to engage with.

Perhaps the most difficult step in story generation is expanding the textual descriptions of museum exhibits into dramatic stories, while at the same time staying true to the exhibit's essence. While a story generated solely using AI algorithms will surely be dramatic, it can easily diverge from the essential meaning of the exhibit. Thus, at the end, the story has to be reviewed by a human curator to ensure that it accurately reflects the museum exhibit while staying engaging and immersive for the visitor.

Additionally, we should note that when creating a story from a CH asset such as a library manuscript, it is essential to use modern language that is easy for contemporary readers to understand and engage with. The application of NLP methods such as text style transfer will provide us a means of creating modern language versions of historical manuscripts and cultural assets' descriptions. The resulting stories will not only bring the past to life for a modern audience but also make museum experience more appealing to younger generations who are not typically attracted by exhibitions. By rewriting stories from a library manuscript in modern language, we will bring historical narratives to life for a modern audience while maintaining their original cultural essence.

Again, here are best practice examples for illustration:

Best practices in interpretation of CH

The Balkan Museum Network (BMN) supports museums to pilot innovative storytelling projects. With BMN Small Grants scheme several innovative examples of storytelling were developed.

BMN member museums implement small grants since 2013. These museum projects are transformative tools that materialize ideas and produce lasting outcomes and impacts. Museums from the Balkan region do not have the capacity to apply to big funding schemes. The process requires knowledge in project management and support from different staff roles working in the museum. Thus, the appreciation for BMN Small Grants scheme is very high among museum professionals from the Balkan Region. BMN Small Grants scheme is easy to apply, implement and report and represents a perfect capacity building process for museum professionals who are interested to work beyond their daily tasks and develop their skills. Projects allow museum employees, most often the curators and educators, to realize results and outcomes that would not be possible with the state funding which does not allow additional program implementation, beyond the

minimum level of activities, and are not open to experimentation, piloting, and innovation.

Small grants create a contained laboratory for museums to develop ideas, test partnerships and gain visibility in the media. Projects that receive funding from BMN small grants scheme often continue and are further developed. The most important impact of small grants is related to establishing trust and partnerships between individuals and institutions, museum and other institutions that participates in the project (home for elderly, school, other cultural institutions such as theatres and non-governmental organizations such as association of disabled people and similar). Successful realisation of a project funded through a small grant is a motivation for the project manager and a museum to continue applying to public calls with new ideas. The museums that have already implemented a small grant are more likely to apply again on BMN call. Through BMN small grants participating museums have developed different aspects of their work and will utilize the effects in the long run. Very often the results of the project (workshops, services, specialized guided walks) become the part of the permanent museum offer. Individuals and the departments in the museum that realized the project receive greater visibility among colleagues and the public. The projects sometimes include the restoration of the part of the museum collection in the project. Museum exhibits are accessible for the blind and partially sighted people through audio guides, flyers and new exhibition panels in Braille. This way, the museum has enriched the museum offer and opened the door to people with disabilities. Participants in the project change their opinion about the museum and its role in the society and offer to volunteer in the museum.

Doll's talks – exciting puppet show in the Museum of Vojvodina (Novi Sad, Serbia)

Figure 3. Doll's talks

The Museum of Vojvodina implemented the project titled "Doll's talks". The project is a new way of presenting the Museum's content adapted for children, aged 4 to 10, using theatrical scenography and puppets. The museum will devise a script for two stories related to its collection to present cultural heritage to children. The first story is "Where did the helmet in my grandma's garden come from?" and the second story would be "Oh, what a beautiful bride!"

With this breakthrough example of heritage interpretation, the elements of the puppet theatre were used to make a visit to the Museum more dynamic and interesting. The basic idea of the project was to present museum stories, which are transmitted by exhibits from the permanent exhibition of the Museum of Vojvodina, through short puppet scenes. The aim was to further motivate children to visit the exhibition. The puppet shows last 15 minutes, and the story is in the form of a conversation with the curator. The play also moves to the other places in the permanent exhibition, depending on the topic.

Figure 4. Roman helmets from Berkasovo

The first story told in this way is about the famous Roman helmets from Berkasovo. A play called "*Where did the helmet in my grandmother's garden come from?*" describes the unusual discovery of helmets with a critical review of to whom the treasure discovered in this way actually belongs. In addition to motivating children to visit the exhibition, the play also sheds light on the concept of cultural heritage. Ultimately, the goal of the project is to develop awareness of the importance of cultural heritage and museum heritage, but also to develop the need and habits for visits to cultural institutions.

FOCUS – Fostering of Capacities for Unique Senses for visitors - The Museum of the Macedonian Struggle for Independence (Skopje, North Macedonia)

The Museum of the Macedonian Struggle for Independence has realized the project "FOCUS – Fostering of Capacities for Unique Senses for visitors". The project had many results, such as access survey process and the report; the production of ten tactile images; production of the audio material; production of the video materials with sign language translation; training of museum staff; improving the access for the permanent exhibition. Museum exhibits in the permanent museum exhibits are not accessible for the blind and visually impaired visitors. Panels in the format 100 x 70 cm with a tactile image and description of the museum object in Braille, photography and short text have been placed in the exhibition space. Sign language videos and audio stories have been made for the museum objects, so that visitors will have the opportunity to hear and learn more about them. The audio and video materials are available on the museum's website, on social media and on museum's YouTube channel, as well as in the space of the permanent exhibition by scanning a QR code.

Textile interpretation with a long-term benefits, Museum of African Art (Belgrade, Serbia)

Museum of African Art (Belgrade) explored and produced new forms of heritage interpretation pertaining to colorful industrial textiles called *khanga* and *kitenge*, which are widely used on the African continent: the khanga cloth is a staple piece of clothing in Eastern Africa, while the kitenge (African/wax print, wax *hollandaise*) is in wide-spread use in various regions of sub-Saharan Africa. These textiles

represent a very important aspect of everyday material culture, thus they are topical in the study and museological presentations of creative contemporary African practices, material and popular culture.

The project was conceived to engage the local African community in Belgrade, not only in terms of visibility within the society, but also in order to give these Africans a voice in the public sphere – to provide an opportunity for them to give authentic interpretations of their own cultural practices. The interpretation of the khanga and kitenge textiles – how they are used and what they signify culturally – took form of in-depth interviews with several African informants. The interviews were recorded on video. Prior research on the topic and preparatory interviews (recorded as audio documents) were conducted with informants from Tanzania, Kenya, Ghana, Nigeria. In addition to the interview sessions, demonstrations of

Figure 5 textile interpretation

certain head-wrapping styles, and body-wraps fashioned out of the cloths given by the informants were also filmed. The project was carried out by the Museum's textile collection curator – senior curator Aleksandra Prodanović Bojović.

The interpretation of contemporary African textiles also brought attention to the necessity of rethinking and modernizing the Museum's textile collection with contemporary textile production – pieces of khanga and kitenge cloths, in order to provide textile samples for reflection, research and cultural interpretation. The enhancement of the textile collection with relevant pieces of fabric was achieved by the acquisition of 25 khanga and 13 kitenge cloths. The purchased khanga and kitenge cloths provided background scenography for the interview set. Khanga cloths typically feature inscriptions in Swahili, which were interpreted by the interviewees, who also used the fabrics to demonstrate how they are typically worn in their culture, as garments or head-wraps.

The objectives of the project were to apply new forms of heritage interpretation (recording testimonies of African informants who are members of the source culture), and creating materials (textile acquisitions, video interviews, audio and photo materials) for future exhibitions, lectures and workshops on textiles; to develop a qualitatively new project and to further broaden the network of African associates as well as seek out other potential partners, based on the previous museum collaborations; to involve African informants/associates as representatives of the native culture in its the interpretation, and engaging them in a museum project.

Aside from meeting these objectives, the Museum of African Art benefited from the project by gaining first-hand interpretation of museum objects and related cultural phenomena, provided by informants belonging to the culture in question. As for the African participants, in addition to being given a platform to voice their views and share their knowledge of their culture, they were also given agency as consultants for the selection and purchase of textiles. They benefited from the project by gaining experience in on-screen speaking / public presentations in the course of the interview recordings, and in talking about traits of their culture to foreigners.

The long-term benefits of the *Khanga and Kitenge Textiles Interpretation* project are numerous. A conscious effort was made to expand the network of African associates. In the course of the project, we have also formed a contact with an African cultural organization in Belgrade (SiVision – Student International Vision), a Serbian clothing designer with significant ties to South Africa, as well as a clothing retailer/distributor that collaborates with other Serbian clothing designers. It is also important to point out that this project represents a part of a larger Museum project involving collection management – the modernization/expansion of the existing textile collection, and heritage interpretation relating to future museum programs and presentations on the topic of contemporary dress in Africa. The video-documented interviews and clothing demonstrations will be used as research documentation for further study by museum experts, which will be made available to other researchers, as well. Segments of the interviews will be used as documentary material at future exhibitions, lectures and presentations on textiles. The video demonstrations will be used as promos for future African head-wrapping workshops. The workshops will be offered to various target groups (cancer survivors, textiles students etc.), thus including and attracting new types of museum visitors. The purchased textiles will be displayed in future exhibitions including African textiles and contemporary clothing. https://www.bmuseums.net/khanga-and-kitenge-textiles-interpretation/

The Bag Full of Toys in the War Childhood Museum (Sarajevo, Bosnia and Herzegovina)

The War Childhood Museum selected stories about museum objects and printed them in Braille. Also, replicas of toys that are museum objects were produced. An inclusive workshop inspired by the Museum's collection was held. The workshop aimed to make different stories and objects accessible to museum's participants, blind and partially sighted children and youth. This activity allowed the participants

to take active participation in one museum's work and explore in depth the experiences of their peers from different countries. Participation of disabled people and experts in inclusion and access during various phases of the project was crucial for the success of the project and implementation of activities.

Figure 6 Bag full of toys and war children

Two more workshops were organized. They aimed at improving internal capacities in the field of access and inclusion. The workshops organised for The War Childhood Museum's staff members were delivered by Aida Šarac from the Art Gallery of B&H. These workshops were focused on improving accessibility and inclusion of WCM as well as increasing knowledge about different educational and pedagogical approaches in work with disabled children and youth in museum settings.

The project was entirely implemented in close cooperation with experts and disabled people, who were along with museum colleagues monitoring every stage of the process and project implementation. With this project WCM has strengthened cooperation with D/deaf and disabled peoples' communities (individuals and organisations); WCM has improved its own capacities by training employees and producing materials accessible to D/deaf and disabled peoples' communities. Producing accessible materials led to increasing the inclusion of Museum and its collection to large community groups; WCM has attracted new visitors and managed to have returning visitors.

Jorgan and Artisans-lost nostalgia captured by MuZEH Lab (Dures, Albania)

Jorgan-Quilt is associated with warming up at night and visualizing pride as a family exhibition of neighbours and potential relatives who come unexpectedly to Albanian families. Hours and dedication show the imagination, texture and mixing to assemble the entire decoration, once a somewhat nervous process as details and precision had to prevail and honour the artisan's hand.

Figure 7 Jorgan and nostalgia

Is not always easy deepening into nostalgia, but when it comes to Jorgans-Quilts, then the conversation is pleasant, especially as women are emotionally connected with this beautiful, creative and everyday object. MuZEH Lab has undertaken some deepen interviews-conversation inside its Lab room for the purpose of collecting the narratives about this particular house item used to be an original creation of men and women artisans of Albania, but not only. Pieces of stories connected with Jorgan-Quilt arouse glimpses of second war II, as this item is supposed to have been an exchange item among rural areas of Kukës (Albania) between Italian soldiers and villagers for something else for eating and other necessities. Much more different is the connection in inner parts of Albania. The connection of women today with their Jorgans is related as a treasure left from their familiars as being sewed by mothers in low. Much more is emotionally related with sacrifices of poverty, and money saved just for made it.

The life of a lady: conservation of interpretation of photographs in The Homeland Museum in Visoko (Bosnia and Herzegovina)

Figure 8. Life of a Lady

The Homeland Museum in Visoko has started digitization of the museum artifacts: the legacy of Marica Vojnović, which consists of a collection of photographs, furniture, textile furniture and a collection of sacral objects from the 19th and the first half of the 20th century. The objects will be protected in a digital form in which they will also be presented and available to the public through the web

platform called "eMuseum". All activities involved student volunteers. After the exhibition as a first activity, lectures have been organized both in the Homeland Museum Visoko and the Museum of the City of Zenica. The training consisted of both theory and practice on digitization of museum artifacts. The result of an active working week has been scanned 368 paper units! Scanning and storing photo processing was done (digital retouching of 30 portrait photos by elimination of tears, patterns, stains, and other technical defects such as shadows, fading, holes, brown spots, raising light, etc.). Photographs received a new outfit for storage – an album, made of hand-cut background from acid-free paper. Also, other objects from the legacy of Marica Vojnović have been photographed: a collection of period furniture, a collection of sacral objects from the furniture of M. Vojnović and textile furniture. The offices of the Homeland Museum have become a modernly equipped photographic studio with numerous spotlights, portable and static cameras, and curtains.

The Homeland Museum of Knjaževac, (Serbia)

Is the complex museum that treasures, researches, presents and interpret cultural heritage of the Knjaževac municipality from the prehistoric to modern times. Rich and various collections are represented in three museum buildings/facilities, different in concept and structure, and one archaeological site. Knjaževac museum has developed several interpretative programs whit the main goal to create a interactive learning process between museum collections and artifacts and audience https://muzejknjazevac.org.rs/en/.

Museum4all/Museum2go

This program was initially supported by the Balkan Museum Network's small grants funded by the Stavros Niarchos Foundation as a digital tool on web and smart devices for improvement of access and inclusion in the museum https://acc.muzejknjazevac.org.rs/en/. Later it was developed into the

interpretative program funded by the Serbian Ministry of Culture. The program provides stories about museum profession, museum as institution and thesaurus of collection. It is based on the concept of "museum in the suitcase" and offers real life experience, sensory elements, interaction with museum collection, but also it has a digital part represented on the website of the program https://muzejzaponeti.muzejknjazevac.org.rs/, free to download application https://play.google.com/store/apps/details?id=org.arhimedia.emg.knjazevackofer&pli=1 for Android and iOS devices. The main content is organized in several thematic parts: Museum Bon Ton, Suitcase with six chapters: Explore, research and preserve, Made to last, Listen, Experience art, Learn about Knjaževac, Bitola (Roman provinces); Passport that is in corelation with the illustrated interactive educational workbook and worksheets; and Cook book with traditional recipes supported by additional audio-visual, 3D models and elements of virtual/augmented reality.

NI Institute and Museum Bitola

The Institute for preservation of monuments of culture and Museum Bitola, or in short NI Institute and Museum Bitola is a national institution of culture which main goal is the protection, systematization, scientific processing, and presentation of the cultural legacy of municipality of Bitola.

This institution activity, program, goals and tasks are performed through the museum departments, protection departments and common service sector.

Among numerous scientific and educational programs of the Museum in Bitola, there is a set of programs developed with the purpose to improve interpretation of museum collections, accessibility, and inclusion. Bitola museum has started development of interpretative, accessible program with the financial support of the Balkan Museum Network through the Small Grants, and continued with the help of national Ministry of Culture towards increased accessibility and improved interpretation of NI Institute and Museum Bitola with new services for visitors https://muzejbitola.mk/en/welcome/.

E-Museum

This educational program aims to present and interpret museum collection in accessible and inclusive way. It uses sensory elements, and provides audio/visual, tactile content followed by tactile descriptions and narrations and QR codes

(abbreviated from Quick Response Code). Compared to the BAR code, the QR code can transfer more information, including a link to a website where visitors can find more information. In this way, the museum exhibit on display is enriched with the background information.

With a small grant from the Balkan Museum Network, cultural heritage in the museum of Bitola is presented in a new way, taking into account that the website of the Bitola Museum is already designed as "responsive", suitable for viewing on all mobile devices.

Some activities that increased the accessibility of museum was preparing descriptive texts (both in Macedonian and English), audio narrations and producing the videos in sign language for fourteen (14) representative objects from the museum exhibition. Next to each object in the exhibition, a QR code is placed, which when scanned with a mobile phone leads the visitor to an appropriate web location. The entire museum is covered with free Wi-Fi Internet connection, which was also enabled within this project.

The advantage of this approach is that visitors use their own smartphones and tablets, with which they can view, comment and share comments about the objects and the exhibition they are enjoying. Adding an audio narration, allows the visitor's smartphone also to be used as an audio guide. Using fusing machine for the production of tactile images, the project team produce twenty-one (21) tactile images for the interpretation of museum objects. Some of these objects were also described with produced audio content that was tailored for the needs of blind and visually impaired visitors.

This approach is relatively new and in the following period it will be further tested and improved. The project was implemented in cooperation with the experts and organizations from the Balkan region and to our great satisfaction, the pupils from the Institute for Rehabilitation of Children with Impaired Hearing – "Kočo Racin" Bitola, were the first to test the new services. It was evident that the children enjoyed seeing in person the objects from their school textbooks, presented in a sign language and with audio description. This project was implemented with the support of the Headley Trust UK through the project of the Balkan Museum Network "Stories of the Balkans" https://muzejbitola.mk/en/category/e-museum/.

Interpret Europe

Museums are developing excellent examples of heritage interpretation. European association Interpret Europe. membership-based organisation that acts as a European platform for cooperation and exchange, especially on research and education, organises events for networking and training and supports the development of national associations for interpretation in European countries. CH professionals are members of Interpret Europe as individuals as well as organisations and within this framework develop diverse approaches on bringing heritage alive with storytelling methods.

Museum of Bećarac (Croatia)

Innovative and cutting edge examples of storytelling we can be found ,in Croatia thanks to the work of Muze ltd. that create hand-tailored heritage experiences for all the senses. The most recent example is opening of the Museum of Bećarac in Croatia in 2023.

"Bećarac is a traditional vocal-instrumental song that is considered an intangible cultural heritage of Croatia and is protected by UNESCO. This small but powerful song consists of only two rhyming ten-point verses but sings about nearly all the aspects of one's life, with an emphasis on love and eroticism. Bećarac lives through its people. As intangible heritage, Bećarac does not exist without the people who live it and protect it. (…) The Museum of Bećarac has become a medium that conveys their voices, while at the same time enabling each visitor to connect to the content in a playful, yet meaningful way. Intangible heritage through tangible media The permanent exhibition is organised in five large thematic units covering 426sqm of carefully designed scenography, rich with numerous interactive experiences. The exhibition shows Bećarac through the stories of the wine culture of Slavonia, through all phases of human life, through the calendar year and customs, and finally through contemporary and different, sometimes technologically advanced, views." Bećarac – A small song that tells a big story by Melita Trbušić (Croatia) https://interpret-europe.net/wp-content/uploads/2023/03/PDF-Newsletter-2023_1-spring.pdf

Storytelling best practices in Romanian Libraries (ANBPR)

Starting with 2011, libraries have become involved in digital storytelling as a means to motivate and engage patrons in developing and keeping local memory and traditions, and community cultural identity. This process is also used in teaching digital skills, especially to seniors.

A number of national projects have been developed since 2011, among which Cultural Agora @ Your Library, developed by the ANBPR Romania, and DigiTales and Silver Stories, developed by the Progress Foundation. Starting with 2011, thanks to the mentioned projects, more than 350 librarians were trained in audio and video editing techniques and the development of digital stories, in order to further disseminate these skills in their local communities.

Cultural Agora @ Your Library

http://www.agoraculturala.ro/en/

The project aimed to promote cultural diversity by understanding the values of the various minorities, fostering interethnic dialogue and education collaboration between users and librarians, with the support of technology. By objectives and activities of Agora Cultural @ Your Library, library space has become a true "agora" for the purposes of representation and participation of all community members, regardless of their level of education, social position, or degree of familiarity with the use of technology and realization of digital stories. Innovative approach to knowledge management project consisted of cultural and users' personal stories through public libraries.

By accessing Cultural Agora, the participants had the opportunity to produce and share their own stories, videos, texts, photos and voice their values and beliefs of their own ethnic group, using the Digital Storytelling technique. Libraries have become an area of interethnic dialogue; the digital stories offer a pleasant way to preserve the collective memory of the community and to facilitate the exchange of knowledge and experiences among different categories of library users.

In terms of nature and scope of activities, in the context of Cultural Agora project were generated over than 1,500 stories digital from more than 190 stories about Roma culture, with the participation of over than 1,500 participants, including more than 500 ethnic participants, from which 230 Roma participants and over than 170 librarians.

The Cultural Agora project supported 4 libraries in Bucharest, Cluj, Sibiu and Braila to become community centres for digital stories. Based on the free workshops facilitated by librarian-trainers during the 20-month project, more than 1,500 library services users involved in Digital Storytelling sessions have produced more than 1,500 original digital stories.

The project also supported the participation of members of various local ethnic communities (Hungarians, Germans, Turks, Tartars, Hebrew, Roma etc.). Based on digital stories produced and collected the 4 libraries have organized temporary exhibitions of digital stories using electronic equipment procured under the project (plasma cameras, recorders, etc.).

Librarians, together with the creators of digital stories, have also organized some public debates with the public to help create common cultural reflections in each library and to strengthen cultural "agora" emulation space. After organizing free workshops on digital storytelling with dramatic potential achieved by users have become the inspiration source for an original theatre show - IN YOUR OWN WORDS - which was presented in all 4 centres and it is currently included in the permanent repertoire of REPLIKA Cultural Association. During the Cultural Agora project was created also a common portal of cultural diversity and identity in Romania, focusing on specifics and added value of the cultural heritage of minorities.

The project idea appeared from the Romanian society need to find landmarks and cultural authentic values in the detriment of real anti-patterns promoted by the media. Lack of knowledge of authentic cultural values was significantly influenced by the unfortunate interferences between mass-media, internet, newspapers, and television in Romania, interested in disseminating doubtful and unfiltered cultural content. Starting from these premises, Cultural Agora project designers' team decided to focus on Romanian cultural capital, focusing on education and the creation of innovative services at the library in order to encourage people to participate in cultural life.

Through the proposed activities, the project has encouraged the access to culture and promoting cultural diversity and inter-cultural dialogue by supporting public libraries to become spaces of cultural effervescence that stimulates curiosity, inspires, educates and connects audiences to culture, by using digital story techniques.

First of all, the project established a long-term partnership between ANBPR - Jazzmontor AS Norway - REPLIKA Cultural Association in Romania. The collaboration within the Cultural Agora project meant a permanent experience and know-how exchange between these organizations and has contributed significantly to increasing the professionalism level and extending the range of expertise of each of the involved parties.

The complexity of the activities and the specifics of collaboration in the arts field, Cultural Agora allowed to create a strong community of passionate storytellers and their mentors, who learned from each other and who have consistently improved

their skills in the use of technology, in editing digital stories and in identifying and addressing several cultural themes, focusing on cultural diversity and participation of minorities in preserving and enhancing and value the specificity of culture of the various ethnic communities in Romania.

On the other hand, this partnership project led to the creation of a common portal of cultural diversity and identity in Romania, focusing on specifics and added value of the cultural heritage of minorities. Over the 20 months of implementation, they have joined the project, as supporters and ambassadors for the cause of Cultural Agora @ Your Library, numerous cultural and artistic institutions, libraries and NGOs involved in the cultural and minority representative media and local institutions.

Built on cooperation relations established between public libraries in 4 counties (Metropolitan Library of Bucharest, "Octavian Goga" County Library Cluj, "ASTRA" County Library Sibiu and "Panait Istrati" County Library Braila), this project has highlighted the role of the library in community education in respect for cultural diversity, using digital stories technique.

The Cultural Agora project introduced in Romanian public libraries a set of tools and techniques based on modern technology, through which users of library services, belonging to different ethnic communities, have become creators of original digital stories on relevant cultural themes. In this way, the public library became, in its turn, a central actor in intercultural dialogue of different ethnicities.

In terms of innovation, Cultural Agora offered a modern approach of cultural diversity, in an interactive and collaborative manner, inviting participants to share their experiences and cultural values through Digital Storytelling technique.

After acquiring knowledge regarding the use of video editing tools, participants in the Cultural Agora sessions will be able to use these technological knowledge and skills in many other activities, including to promote their community for personal branding, tourism purposes, etc. which will contribute to long-term sustainability of Cultural Agora @ Your Library investment.

Through its creative and innovative approach of the cultural diversity, with special emphasis on minority identity, Cultural Agora portal is and continue to be a multi-disciplinary portal of conservation of cultural specificities of ethnic groups that coexist in the same space.

Another innovative element of the project is to collect multicultural digital stories, facilitated by experienced librarians-trainers. Thanks to this project, library, as a main binder and message bearing at the public at large level, became an important

vector in the exchange of cultural knowledge, with great benefits for consumers of culture and cultural education broadly. By developing and disseminating collections of digital stories produced within the project, the libraries involved have contributed significantly to the growing taste for culture and involvement of community members in urban and rural socio-cultural life by stimulating creativity, individual expression and the personal skills development.

By creating a space of cultural emulation at the public library, the Cultural Agora project generated a massive cultural movement in spirit of attracting young people to culture, arts, community participation and cultural inspiration activities.

More than 1500 individuals all over the country were trained, in their turn, and developed digital stories using the audio and video editing techniques learned at the library. Their stories are available online and thus contributed to the production of local digital content.

Cultural Agora @ Your Library has focused on the integration of ethnic communities and provides them with an opportunity to tell their stories, so that almost a quarter of all the digital stories created as part of the project belong to various ethnic groups. More than 150 stories were created by Roma ethnics.

Also, through a special care given to structured learning and sessions guided by trainers, librarians and certified mentors from the arts field, Cultural Agora project has helped support the intellectual formation of children, youth and adults through several pro-culture activities, supported by technology, thus stimulating different categories of audience to participate at many activities with an important cultural component.

DigiTales - Extending creative practices

https://www.progressfoundation.ro/proiecte/

In the period 2011 - 2012, the Progress Foundation facilitated the participation of 14 training librarians from 12 counties of Romania in the professional training course in the methodology of Digital Stories (DigiTales) organized by Goldsmiths college in Great Britain.

Upon returning to Romania, the librarian trainers in turn trained seniors from the communities they came from and thus achieved three important objectives: preserving the cultural identity of the communities, digital literacy, digital inclusion of the elderly.

Over 100 personal, interesting and captivating digital stories were created within the project, with the participation of librarians from public libraries.

DigiTales – a different type of stories

Based on the Digital Storytelling methodology, the DigiTales project, funded by the IREX Foundation in 2013, contributed to the acquisition of digital skills for librarians in creating stories using audio-video editing software, thus contributing to the expansion of the services that libraries can provide to communities.

The stories made within the DigiTales project consisted of short narratives, between two and ten minutes. These stories, made with the support of technology, had various themes, being able to serve as a source of inspiration in the educational environment. The involvement of public libraries in the creative development of stories has led to positive changes in the lives of librarians and users of library services.

Silver Stories

Silver Stories is a project financed by the Leonardo da Vinci program, Transfer of Innovation, which continues the project DigiTales – Extending creative practices (2011-2012, financed by the program Grundtvig) and the national program DigiTales, financed by IREX (2013). The main objectives of the project are the creation of a new digital storytelling course and its delivery by 11 librarian-trainers, in 11 county libraries, for 16 specialists in the education of disadvantaged groups (NGO representatives, employees from public institutions - social workers, psycho-pedagogues, psychologists etc.).

ANBPR - present within the Generation Code Fair at the European Parliament!

Figure 9 ANBPR - present within the Generation Code Fair

ANBPR participated as an exhibitor, between October 18-19, 2016 at the Innovation Fair Generation Code – born at the library, an interactive exhibition branded Public Libraries 2020, in the context of the Code Week Campaign of the European Union. The representatives of the libraries from all 28 member states of

the European Union present at Generation Code had the opportunity to meet with the European deputies from their countries during a "Meet and Greet" session, specially organized for this purpose. The ANBPR delegation received the visit of 7 Romanian MEPs (Monica Macovei, Renate Weber, Viorică Dăncilă, Cristian Dan Preda, Victor Negrescu, Emilian Pavel, Laurențiu Rebega), with whom they exchanged opinions on how libraries in Romania face the digital challenges specific to this era.

Between 01-03 February 2016, ANBPR, as the initiator of the Eusphere project, was represented in Brussels, at the Library Advocacy 4 EU workshop, organized by PL2020, EBLIDA and the Latvian Libraries Association. On this occasion, the Executive Director of ANBPR, Ioana Crihană, proposed to the Reading & Writing Foundation representatives a project idea that would bring together traditional Romanian folklore and programming skills, with the facilitation of librarian trainers. This idea was highly appreciated and received with great enthusiasm, and a few months later ANBPR received the invitation to develop the project proposal for funding.

The ANBPR project developed an innovative concept of the ANBPR exhibition stand within Generation Code at Your Library, Edition 2016, based on three types of technology-based installations, namely:

• a holographic projection solution consisting of a prism assembly, a mirror system, and an exposure support, in which the image of an authentic Romanian folk costume was virtually recreated;

• an indoor video-mapping installation, with the help of which a 3D film gallery was projected onto a small model of the National Library of Romania building in order to create the illusion that the miniature replica of the National Library of Romania is animated, through -a sequence of light frames;

• an installation consisting of a life-size mannequin dressed in authentic Romanian folk clothes. "Beacons" type devices (a kind of button-sized LEDs) carrying data were installed under the popular straia.

By programming, these "beacons" are able to play information and data sets that they make accessible on a tablet or smartphone. When approaching the mannequin with these devices, the visitor can read, directly on the display of the respective equipment, descriptions of the various components of the popular costumes.

The exhibition Generation Code – born at the library was conceived as an opportunity to experience programming first-hand and to get in touch with digital experiments carried out by innovative public libraries in Europe.

Among the important personalities who visited the Romanian stand were the following Romanian MEPs: Monica Macovei, Renate Weber, Viorica Dăncilă, Cristian Dan Preda, Victor Negrescu, Emilian Pavel, Laurentiu Rebega.

Impressed by the work in support of innovation carried out by Romanian librarians and by the professional way in which they understand the interface between users and technology, the Romanian MEPs requested more details from the ANBPR representatives regarding the involvement of Romanian libraries in the process of digital literacy and learning throughout life course.

It was extremely honorable for the Romanian delegation to be part of the elite of innovative librarians from the entire European Union, who proposed technological solutions of great interest at an unprecedented level of exposure.

This participation was also an extraordinary opportunity to interact with fellow librarians from the other states of the European Union and to exchange best practices with the best professionals in the field. Romania's stand enjoyed great interest from the MEPs participating in the event. The ANBPR delegation held talks with Romanian and foreign MEPs and thus won their support, as ambassadors of the Romanian intelligentsia and the cause of libraries - as agents of change and progress at the European level.

Our Voice Counts!

Figure 10 "Our voice counts!"

Our Voice Counts! project was developed by the Association for Assistance and Programs for Sustainable Development - Agenda 21 in partnership with the National Association of Public Librarians and Libraries in Romania, the Startlight Petra Association and Norsensus Mediaforum Norway, with financial support of Active Citizens Fund Romania, program funded by Iceland, Liechtenstein and Norway through the EEA Grants 2014-2021.

The project included an activity dedicated to the use of the digital storytelling technique by people with hearing and sight impairments.

Beneficiaries were trained and guided by specialized story-makers recruited from public libraries and encouraged to create their own stories, using videos, texts, photos and other tools. A total of 50 digital stories were produced and included in a Guide. A synthesis of the most successful stories will be transcribed in Braille and distributed widely.

The "Our voice matters!" stories with the authors themselves being children and young people with visual and hearing impairments from Bucharest, Buzău and Râmnicu Sărat, were included in a Guide entitled **"Our Voice counts!" Guide - Animated stories,**

storytellers with grace, which was widely popularized through partners, friends and project supporters' channels.

Through the "Our voice counts!", project more than 900 children and young people, both children with visual and hearing impairments from special schools, as well as typical children from mainstream schools, had the opportunity to interact, participate in the project's activities and to debate on the rights of visually and hearing impaired people.

The most popular digital stories created by young storytellers have also been transcribed into Braille to make them accessible to the visually impaired. Beneficiary partners in the project, along with 7 mainstream schools and 7 special schools, were also 4 libraries, namely:the National Library of Romania, the Metropolitan Library of Bucharest, the "V. Voiculescu" County Library Buzau and the "Corneliu Coposu" Municipal Library, Râmnicu Sarat, Buzau County.

4.2.5   RESEARCH METHODOLOGY

Considering the prior experience with best practice examples, our methodology for defining stakeholder user requirements regarding CH experts can follow a two-fold strategy. The first consists of analysis of the case studies just outlined and additional ones to come, in order to deduce user requirements in practice. The second approach is the collection of empirical data, to which end the knowledge gained from the prior experience helps inform the empirical tools (e.g. questionnaires, interviews) and in turn to supplement and validate the practical experience by empirical data.

4.2.6   PRELIMINARY RESULTS OF EARLY DATA COLLECTION

As just indicated, the SHIFT consortium is developing methodologies to gather empirical data to supplement the case studies and has distributed a prototype version questionnaire for the purpose of feedback and refinement among the contacts of our partners. In addition to feedback for the questionnaire itself, this also yielded preliminary empirical data to share in this iteration of the deliverable.

ANBPR, as the leader of T.1.1, and the consortium partners launched online the Stakeholder Requirements Study on Cultural Curation, Accessibility, Inclusion and Storytelling - QUESTIONNAIRE, using the Google Forms platform.

The objective of this task was to conduct a comprehensive stakeholder user requirements study on the various challenges commonly encountered on the extended usability of cultural content.

The conduct of this survey took place online, between March 13-27, 2023. The survey was launched to approximately 350 recipients, recruited from the partners' stakeholder bases, representing people active in the field of cultural heritage (museums, libraries, heritage institutions, centers for the preservation and promotion of traditional culture, national heritage institutes, cultural training institutions, memorial houses, other categories of specialists in the field of heritage conservation and preservation, organizations and experts active in the development and integration of software solutions applicable in the cultural and related fields).

The following four parts of the Questionnaire constitute its core and cover the domains provided by WP1, T1.1, respectively: Cultural Curation, Accessibility, Inclusion and Storytelling.

The questionnaire itself was designed to include an informed consent in Anonymous mode, to guarantee the respondents that their contribution to this survey is anonymous, the system not saving personal data, such as the name or ID of the respondents.

In order to clarify the relevance of the Questionnaire for the addressees, the specialized content of the survey was preceded by a series of general questions, regarding age range, gender, professional role, years of professional expertise, the use or not of curation systems assisted by technology, the time interval related to their use, the level of satisfaction regarding the existing technology-assisted system, the frequency of visits made to heritage institutions, the acquisition of knowledge about European culture after these visits, when they last visited a heritage conservation institution, what type of CH assets are of interest to the respondent, what is the respondents' experience with digital technologies in CH institutions, if they have visited a CH institution with digital support (such as recorders, virtual assistant, etc.), if they rate CH content as interesting or not, if they encountered difficulties in distinguishing between the different color palettes used in 16th century painting.

General Data and Limitations

The aggregated data in this report are based on the centralized answers following the application of the Questionnaire, with all the limitations of representativeness compared to the total number of recipients in Romania and the countries participating in the SHIFT project to which the Questionnaire was addressed, as well as the types of cultural heritage institutions who had exponents among the respondents.

Age range:

According to the answers collected, 45.9% of the respondents are between the ages of 46-60, followed by 33.8% of the 36-45 age segment and 12.2% of the 26-35 age segment.
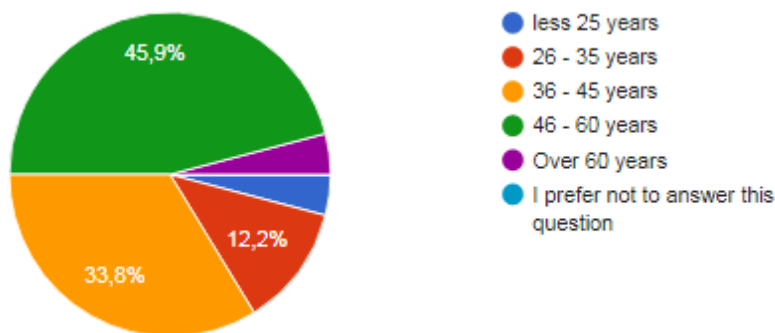
Figure 11 and following - Questionnaire result diagrams

Gender:

Regarding gender representation, according to the answers collected, 70.3% of the respondents are women while 29.7% are men.
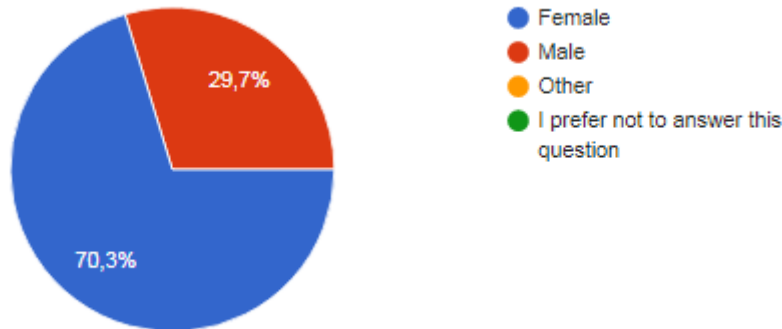
Professional role:

The response rate for this questionnaire was of 21.71% (76 responses from over 350 persons questioned). Although the responses came from librarians - 30% of respondents, and 70% from other professional categories, such as: Director/Manager CH Institution 9%, Museum pedagogue/educator/ adviser/professional 8%, Cultural Heritage Professional 5%, IT Specialists (UX Designer, IT Tester Analyst, Developer, Information architect) 5%, Researcher / Referent 5%, Project Coordinator/ Specialist 5%, Marketing/ PR 5%, Curator 4%, and others, as follows:

Types of respondents based on the Professional Role:

Professional role

IT Specialists (UX Designer, IT Tester Analyst, Developer, Information architect) 5%
Senior Conservator 1%
Researcher / Referent 5%
Public servant / Executive staff on EU projects and networking 1%
Project Coordinator/ Specialist 5%
Office manager 1%
Museologist 1%
Marketing/ PR 5%
Literary scholar 1%
Historian 1%
Evaluator of cultural projects 1%
Ethnographer 1%
Unemployed 1%
Student 3%
Administrator 1%
Archaeologist 1%
Conselour 1%
Librarian 30%
Museum pedagogue/educator/adviser/professional 8%
Director/ Manager CH Institution 9%
Digital Content Creator 1%
Curator 4%
Cultural Heritage Professional 5%
Coordinator of the Training Center 1%

Years of professional expertise:

Regarding the years of professional expertise, according to the answers collected, the majority of respondents, respectively 51%, have a professional experience between 11-25 years, while 22% have a professional experience of over 26 years.

Years of professional expertise

- < 5 years 16%
- 6-10 years 11%
- 11-25 years 51%
- >26 years 22%
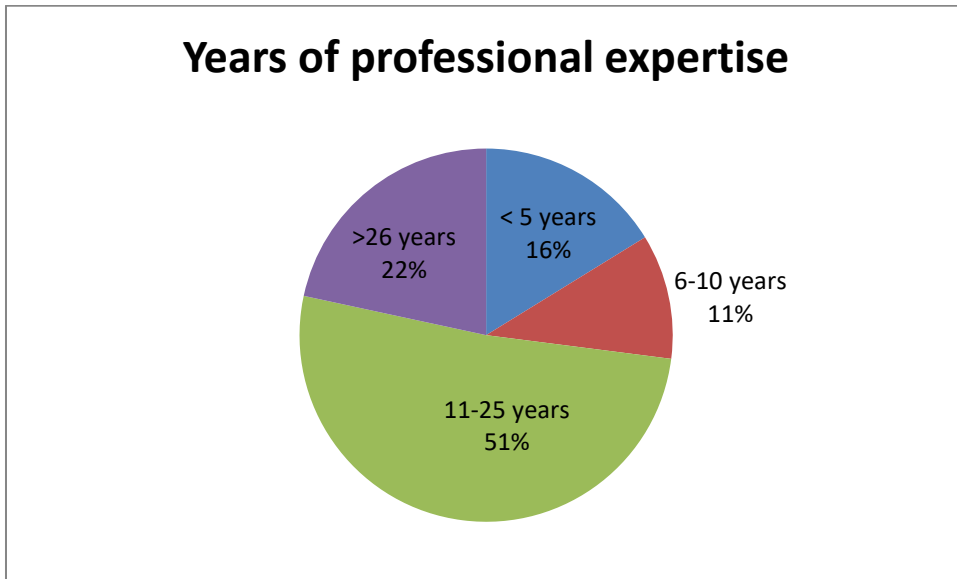
Do you use technology-assisted curating systems?

Regarding use technology-assisted curating systems, according to the answers collected, 50% used use technology-assisted curating systems, while 43.2% did not use technology-assisted curating systems.

- Yes
- No
- Other
- I prefer not to answer this question

43,2%

50%
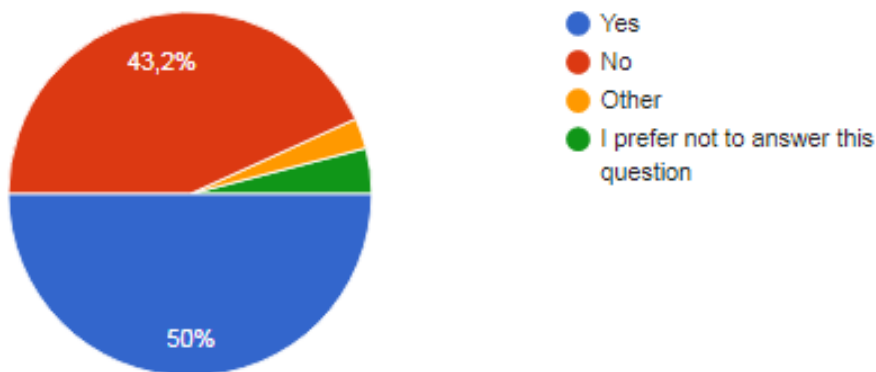
If yes, for how long? (years)

Regarding the number of years since respondents used technology-assisted curating systems, according to the responses collected, 50% preferred not to answer, 18% used technology-assisted curating systems for 2-5 years, while 13% use technology-assisted curating systems for more than 16 years.

How long (years)

more than 16 years 13%

11 -15 years 7%

6 - 10 years 8%

2 - 5 years 18%

0 years 4%

No answer 50%
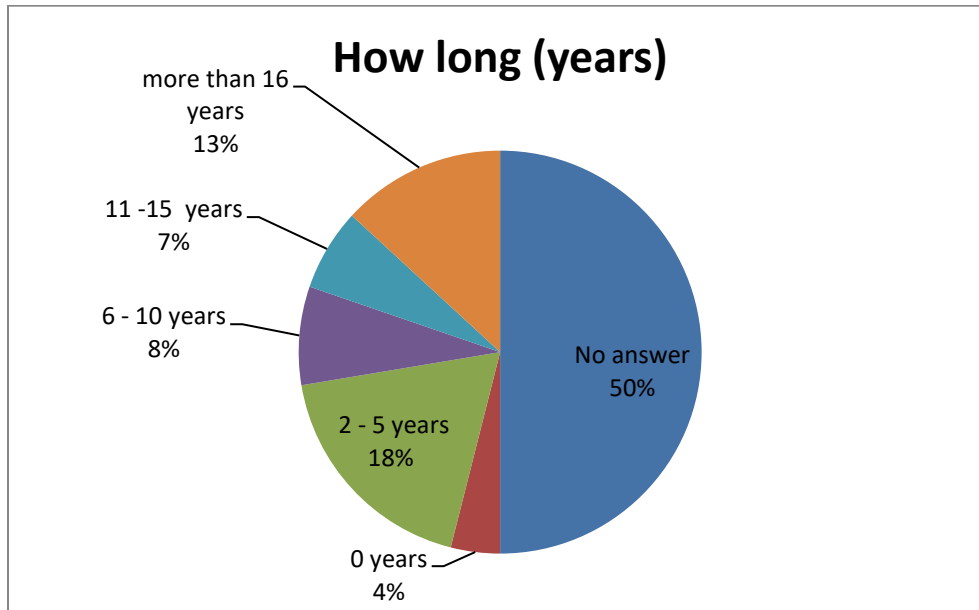
How satisfied are you with existing technology-assisted systems?

Regarding *How satisfied are you with existing technology-assisted systems*?, according to the answers collected, 45.9% of respondents are relatively satisfied, 20.3% are satisfied, while 17.6% are very satisfied.
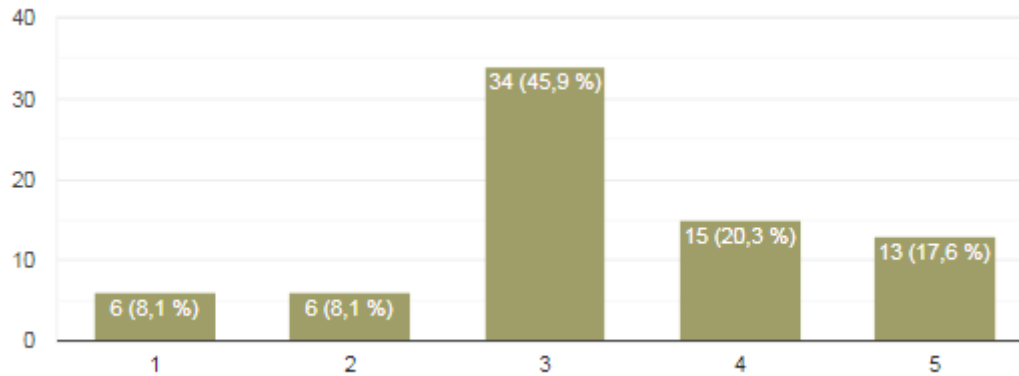
How often do you visit heritage institutions (museums, libraries, archives, cultural institutes, etc.)?

Regarding the frequency of visiting heritage institutions (museums, libraries, archives, cultural institutes, etc.), according to the answers collected, 51.4% of respondents visit cultural institutions monthly, while 21.6% visit these institutions occasionally and 14.9% once every 3 months.
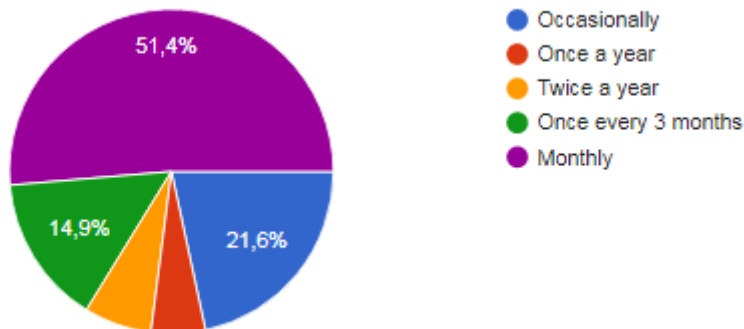
Do you gain knowledge on European culture after the visit?

To the question Do you gain knowledge on European culture after the visit?, 94.6% of the respondents answered positively, and a percentage of 5.4% preferred not to answer answered negatively.
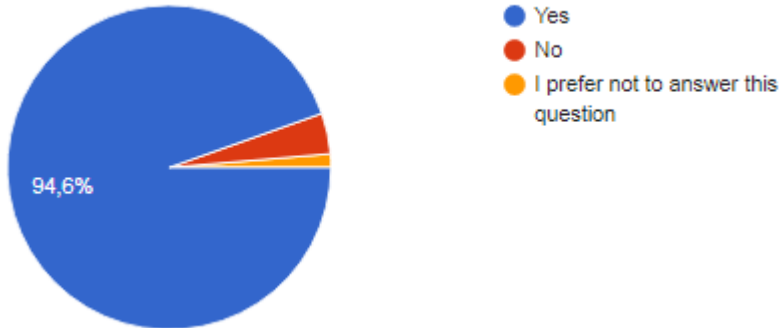
When did you last visit a CH institution?

To the question *When did you last visit a CH institution?*, 55.4% of respondents answered that in the last month, while 23% answered that they visited a CH institution a few months ago and 10.8% answered more than 1 year ago..
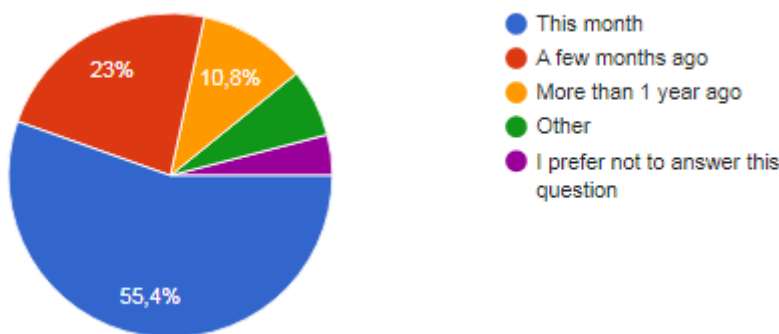
What type of CH assets appeal to you?

Regarding the question *What type of CH assets appeal to you?*, 64.9% of respondents mentioned paintings, an equal percentage of 64.9% opted for old/rare books, and 56.8% of respondents opted for sculpture.
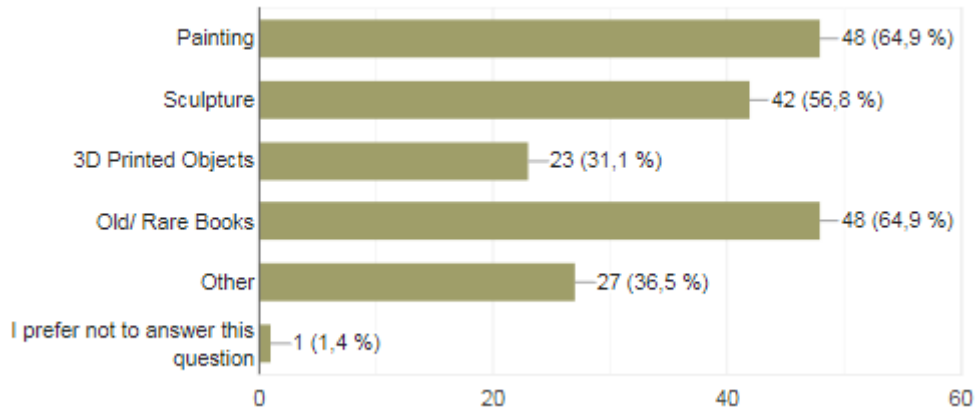
What is your experience with digital technologies across CH institutions?

Regarding the experience of the respondents with digital technologies across CH institutions, according to the answers collected, 77% of the respondents had a good experience, while 9.5% mentioned none one.
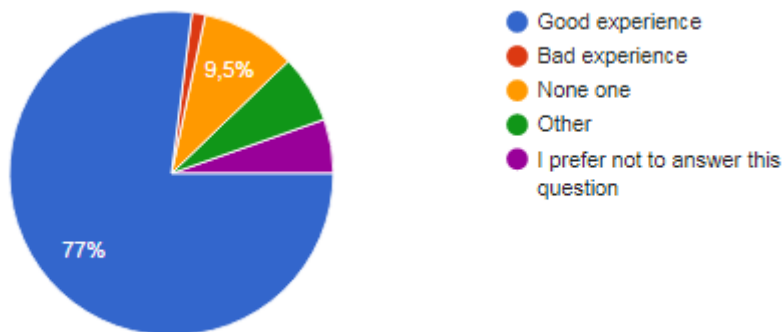
Have you visited a CH institution with digital support (such as recorders, virtual assistant, etc.)?

Regarding the question *Have you visited a CH institution with digital support (such as recorders, virtual assistant, etc.)?*, 68.9% of the respondents gave an affirmative answer, while 29.7% of them gave a negative answer.
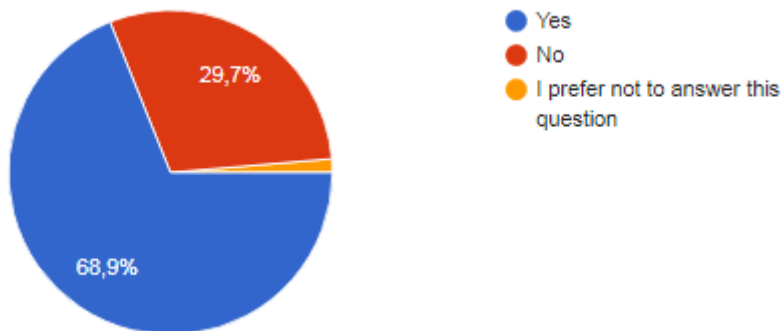
In the age of social media, do you find the CH content disengaging?

In the age of social media, 78.4% of respondents rate CH content as engaging, while 10.8% rate CH content as disengaging.
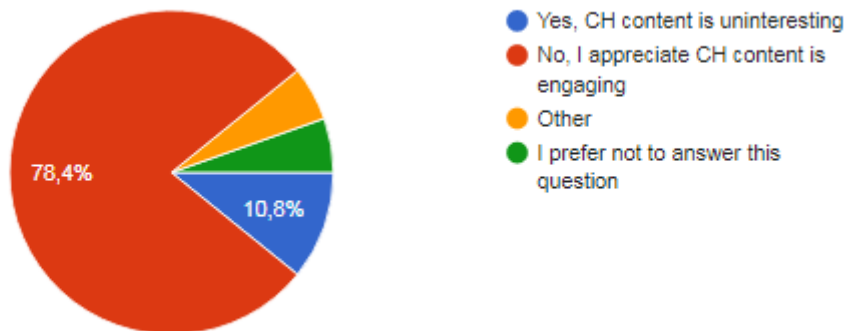
Please select a suitable representation for content transformation from the following:

When asked to select a suitable representation for CH content transformation, 66.2% of respondents opted for Picture to Animation transformation, 63.5% for Text to Speech transformation, and 60.8% for Image and video processing by manipulating visual content. At the same time, 56.8% of the respondents opted for the transformation of static images into Video.
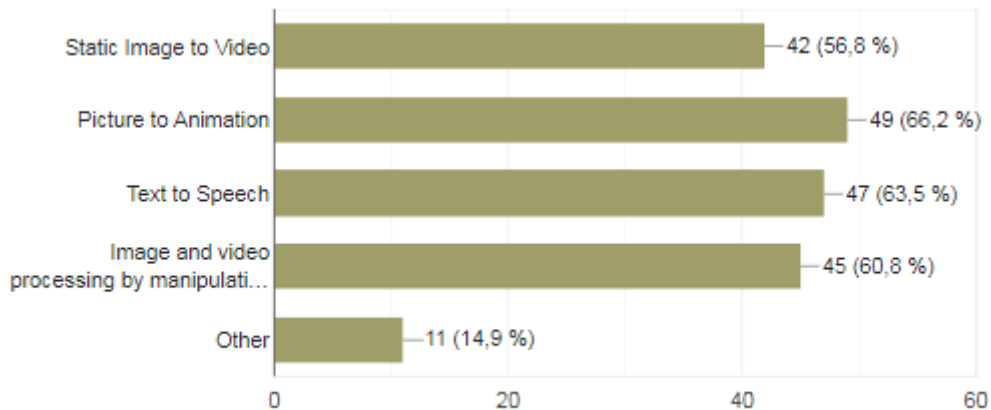
Have you experienced difficulty in distinguishing between different color palettes used in the 16th Century painting?

To the question *Have you experienced difficulty in distinguishing between different color palettes used in the 16th Century painting?*, 51.4% of the respondents did not experience difficulties in distinguishing between different color palettes, while 23% experienced such difficulties**.**
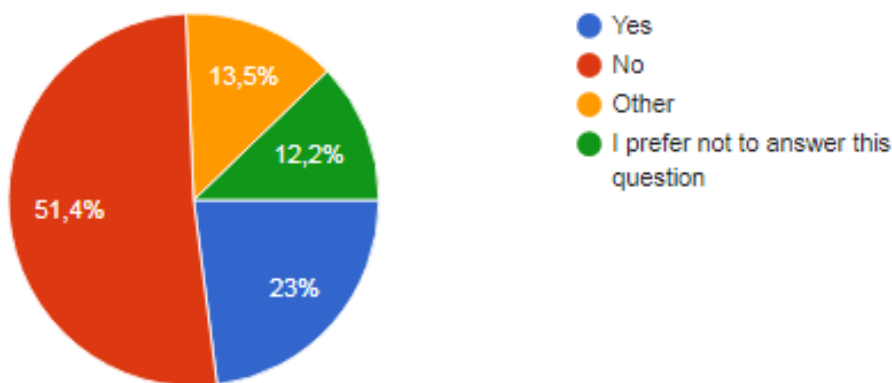
I. CURATION

1. How important is it for you to integrate technology in the creation, delivery, renewal, communication, management and monitoring of cultural assets?

56% of respondents considered it very important to integrate technology in the creation, delivery, renewal, communication, management and monitoring of cultural assets? while 23% considered it essential, and 14.9% considered that it is somehow important.
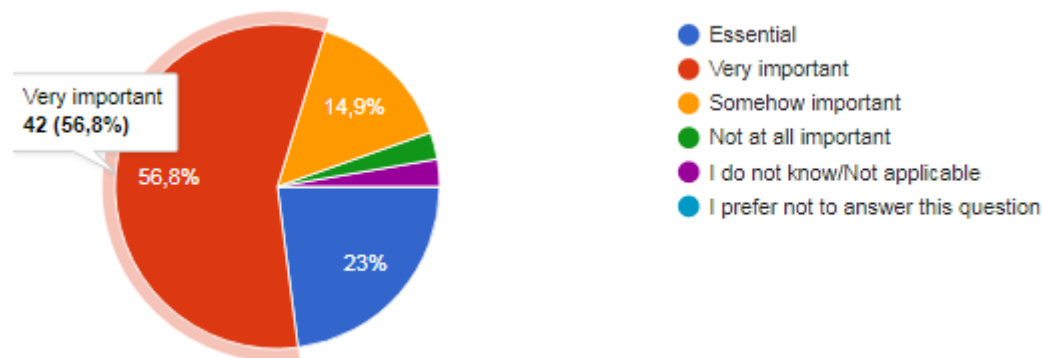
2. What are the main benefits of a technology-assisted system for curating efficiency:

The respondents to the questionnaire considered in proportion 68.9% that Quick and user-friendly access to various approaches and perspectives regarding CH artifacts, with the possibility of sorting, filtering, labelling, classification is the most important benefit of a technology-assisted system for curating efficiency, followed by 64.9% of the respondents who opted for Aggregation of large volumes of information in a limited time and by 63.5% of the respondents who appreciated as an important benefit Facilitating a cultural understanding of the elements of CH in a structured, user-centered manner, which allows the query of different databases, the quantitative & qualitative exploration of representative information for the main and related fields.
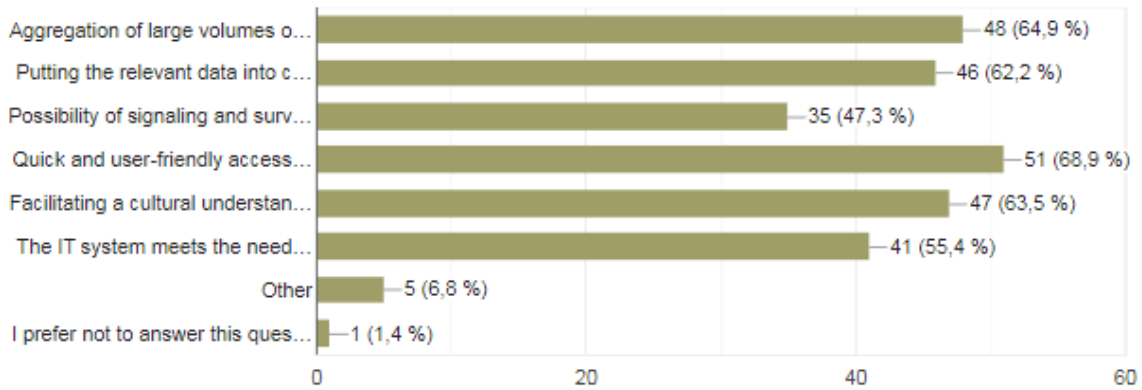
3. Name the main functionalities that you would like to find in an Information Technology (IT) system chosen to optimize interaction with CH assets:

The main functionalities of an IT system for optimizing the interaction with CH assets were from the perspective of the respondents as follows: 83.8% Facilitating access to various digitized CH resources (publications, studies, collections, catalogues, exhibitions, virtual tours, audio-video materials, etc; followed by 73% Easy access to relevant, credible and heterogeneous content in the CH field and assisted navigation on different levels of information detailing, and 56.8% Quick response to punctual cultural information needs.74 responses
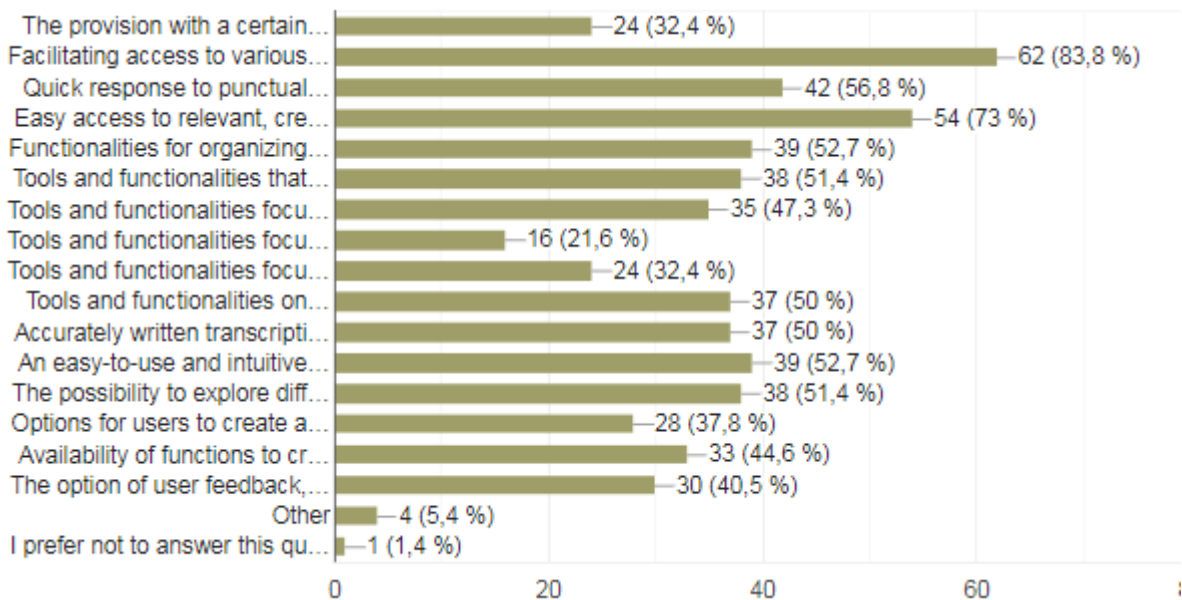
4. Please select the main types of CH content that you consider essential to be included in the IT system supported by Artificial Intelligence (AI) technology:

Main types of CH content considered essential to be included in the IT system supported by Artificial Intelligence (AI) technology by respondents were as follows: 81,1% Multimedia content: images, videos, podcasts and other multimedia formats, which the IT system can sort, metadata and classify according to the topics relevant to the end users' preferences, 68,9% Informational content for general use: news, articles, reports and other descriptive materials, which the IT system can sort, index and classify according to the topics relevant to the end users' preferences, and 59.5% Localized content: CH elements regarding specific local events held in certain geographic locations of interest to certain categories of users, which the IT system can organize, sort and manage according to the user's location.
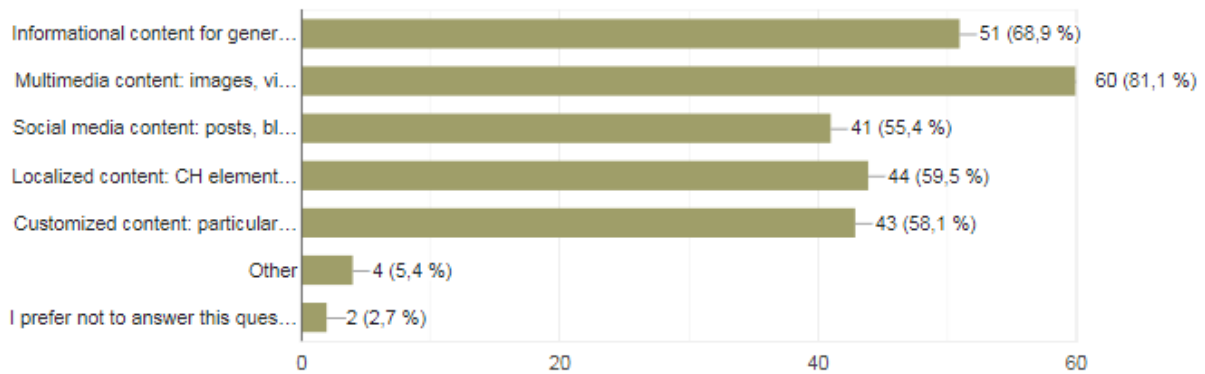
II. Accessibility

1. How could technology assist in improving visitor experience and manage the cultural experience for all European citizens through accessibility and inclusion?

Being asked How could technology assist in improving visitor experience and manage the cultural experience for all European citizens through accessibility and inclusion?, the respondents opted for: Virtual Guides: An artificial intelligence assistant could be programmed to provide information about exhibits and events , as well as answer user questions, in a proportion of 73.7%, followed by Recommendations for Visiting: with the help of machine learning algorithms, recommender systems could analyse visitor preferences and suggest exhibits or

sections of CH collections that might be relevant to end users, in a proportion of 60.5% and Automatic cataloguing: An artificial intelligence system could be used to assist in the automatic cataloguing of CH collections, including recognition of objects and their characteristics, as well as association with appropriate metadata and Automatic translations: An AI system could be used to translate written or audio-video materials on CH assets in a more familiar and contemporary language, to facilitate an easy access for different categories of visitors for which 60.5% of respondents opted for.
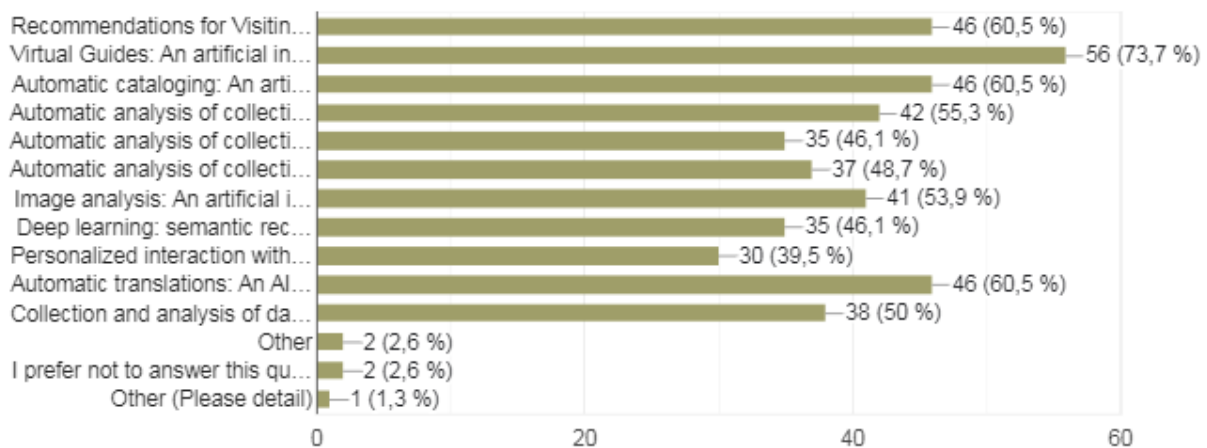
2. Have you encountered any technology that would improve the interaction of citizens with European culture?

When asked about technology that would improve the interaction of citizens with European culture, 63.2% of respondents opted for digital representation of objects to watch on visitor's devices (like tablets): to magnify images, to highlight details, to strengthen contrasts , to delete details; this could help partially sighted persons or persons with motoric problems, while 57.9% opted for Automatic translation of information in different languages including "easy-to-read" language for persons with intellectual disabilities, and 56.6% have opted for Accessibility: access to cultural heritage information in a variety of formats, including text, image and media. An AI-assisted IT system could allow access to this information through an intuitive and personalized interface.

Bar chart data:
- Automatic translation of infor… — 44 (57,9 %)
- Automatic generated virtual… — 30 (39,5 %)
- Recommendations for visitin… — 32 (42,1 %)
- Digital representation of obje… — 48 (63,2 %)
- Automatic graphical and aud… — 34 (44,7 %)
- Efficient search: search for c… — 33 (43,4 %)
- Information for visitors read… — 24 (31,6 %)
- Automatic adaption of audio… — 26 (34,2 %)
- Interactivity: interaction with… — 40 (52,6 %)
- Accessibility: access to cultu… — 43 (56,6 %)
- Customization: possibility to… — 22 (28,9 %)
- Translations: Users who do… — 37 (48,7 %)
- Access to information from… — 32 (42,1 %)
- Other — 3 (3,9 %)
- I prefer not to answer this qu… — 3 (3,9 %)
- Informations for visitors read… — 1 (1,3 %)
- Other (Please detail) — 1 (1,3 %)

3. Would you agree that a virtual visitor guiding system does not fulfill all requirements of the corporate design of your organization if different designs are more accessible for persons with visual impairment?

When asked if they agree that a virtual system for guiding visitors does not meet all the requirements of the corporate design of the organization if different models are more accessible for people with visual impairments, an overwhelming 68.4% of the respondents answered affirmatively, in while 13.2% preferred not to answer this question, and 9.2% answered negatively.

Pie chart:
- Yes — 68,4%
- No — 9,2%
- Other
- I prefer not to answer this question — 13,2%
- Other (Please detail)
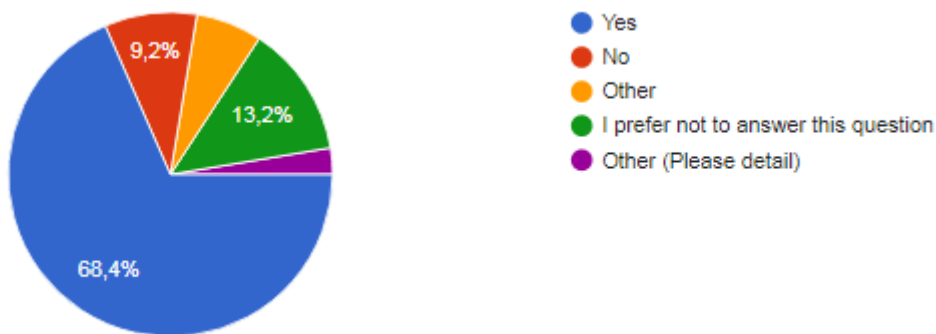
4. Would it be attractive to have a tool which changes persons in digital images of objects in your collection, such as men in women, white in coloured people, adults in children, walking people in wheelchair users etc.?

When asked if it would be attractive to have a tool that changes people in digital images of objects in collections, such as men into women, white people into black people, adults into children, people walking into wheelchairs, etc, 50% of respondents answered negatively, while 28.9% answered negatively, while 15.8% preferred not to answer this question.76 responses.
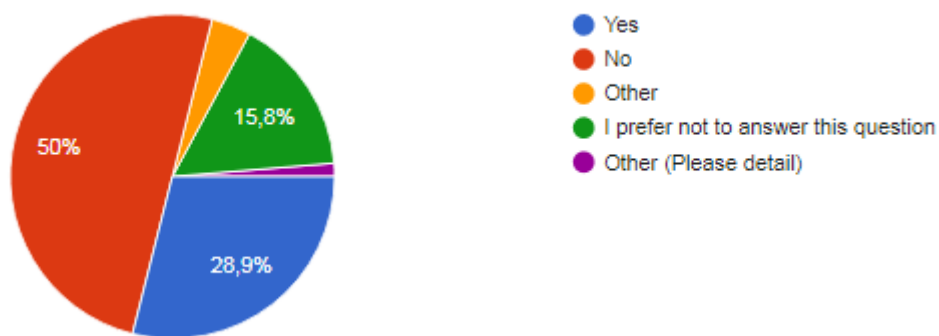
5. Would you use an automatic guiding system which composes special tours in your collection with objects regarding children, gender equality, ethnic aspects, disability etc.?

When asked if they would use an automatic guide system that composes special tours in the collection of objects related to children, gender equality, ethnic aspects, disabilities, etc., 81.6% of respondents answered affirmatively, while 11.8% of they gave a negative answer.

Legend:
- Yes
- No
- Other
- I prefer not to answer this question
- Other (Please detail)

81,6% 11,8%
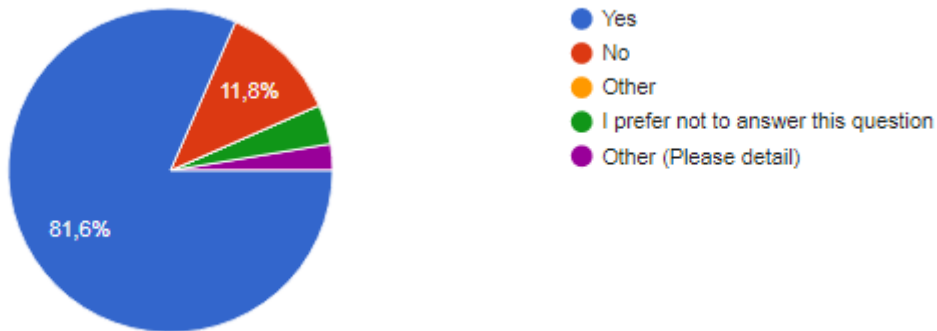
6. Please select the main needs of the end users engaged in exploring a technology-assisted system for increasing the quality of understanding of CH assets in terms of curation, accessibility, inclusiveness and storytelling:

When asked to select the main needs of end users involved in exploring a technology-assisted system for increasing the quality of understanding of CH assets in terms of curation, accessibility, inclusion and storytelling, 82.9% of respondents opted for Accessibility: possibility of access to cultural heritage information in a variety of formats, including text, image and media, through an intuitive and personalized interface. AI-assisted computer systems could provide accessibility through advanced search tools and recommendation algorithms., 78.9% of respondents opted for Storytelling: possibility of understanding the context and meaning of cultural heritage through stories and narratives. AI-assisted computer systems could use speech synthesis algorithms to tell the story of CH objects via text narration in an engaging vibe, while 77.6% of respondents selected Inclusivity: possibility to have a cultural heritage exploration experience that takes into account various needs of different typologies of people, such as younger or senior persons, people belonging to different cultures, other types of vulnerable persons, etc.

Curation: possibility of access t... — 53 (69,7 %)
Accessibility: possibility of acce... — 63 (82,9 %)
Inclusivity: possibility to have a... — 59 (77,6 %)
Storytelling: possibility of under... — 60 (78,9 %)
Other — 4 (5,3 %)
I prefer not to answer this ques... — 2 (2,6 %)
Other (Please detail) — 1 (1,3 %)
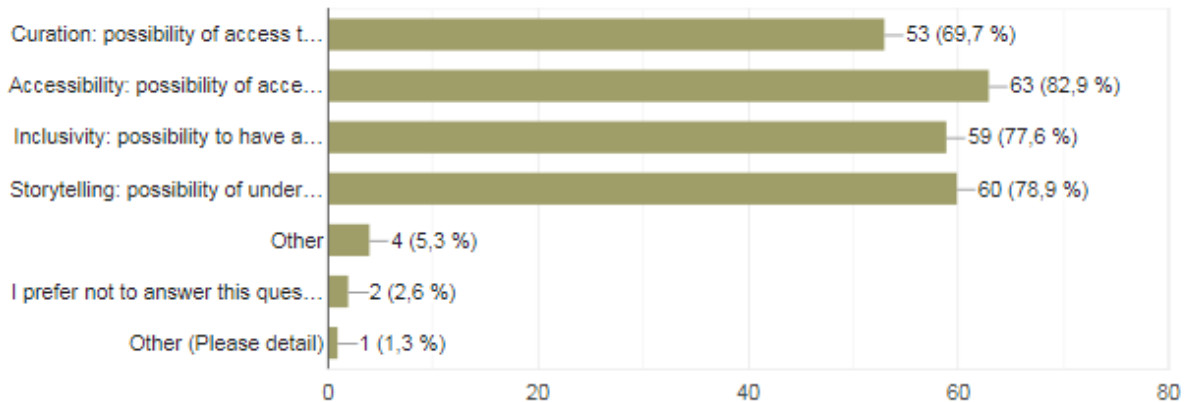
7. What accessibility and user-friendliness features of a computer system can be considered from the point of view of the general public?

When asked about the accessibility and ease-of-use characteristics of an IT system that can be taken into account from the point of view of the general public, 84.2% of respondents considered Interface accessibility: the system can be used easily by all users as a priority , including disabled people, while 67.1% of respondents selected Customization and adaptability: users can customize and adapt the system according to their needs, such as being able to change the font size or adjust the contrast level, equal to option Language adaptation to present: The use of simple, accurate language and according to the level of understanding of different categories of users. The next option in the respondents' preferences was the Cross-platform availability: the system should be accessible and usable on different devices such as desktop computers, laptops, tablets, mobile phones, with 64.5%.

Feature	Value
Interface accessibility: the sy...	64 (84,2 %)
Bilateral system-user interac...	39 (51,3 %)
System navigation: users ca...	47 (61,8 %)
Content accessibility: users...	48 (63,2 %)
Customization and adaptabil...	51 (67,1 %)
Cross-platform availability: t...	49 (64,5 %)
The intuitive and simple desi...	42 (55,3 %)
Language adaptation to pres...	51 (67,1 %)
Providing visual and spoken...	35 (46,1 %)
The inclusion of detailed des...	38 (50 %)
Indexing and sorting of objec...	38 (50 %)
Assistance and support for a...	36 (47,4 %)
Providing the possibility to s...	41 (53,9 %)
Support for viewing and dow...	36 (47,4 %)
Other	5 (6,6 %)
I prefer not to answer this qu...	4 (5,3 %)
Bilateral interaction system -...	2 (2,6 %)
System Navigation: users ca...	1 (1,3 %)
Other (Please detail)	1 (1,3 %)

8. What accessibility and user-friendliness features of an IT system can be taken into account from the point of view of visually impaired people?

Accessibility and ease of use features of an IT system that can be taken into account from the point of view of visually impaired people were the following in the respondents' preferences: Using a clear and intuitive navigation menu adapted to the visually impaired (77.6 %), followed by Using an appropriate font to facilitate reading for people with low vision (73.7%), and with a percentage of 69.7% Using alternative descriptions for images, graphics and captioning for multimedia elements to make them accessible to people with low vision and respectively Providing the ability to change the font size to make reading easier for people with low vision.
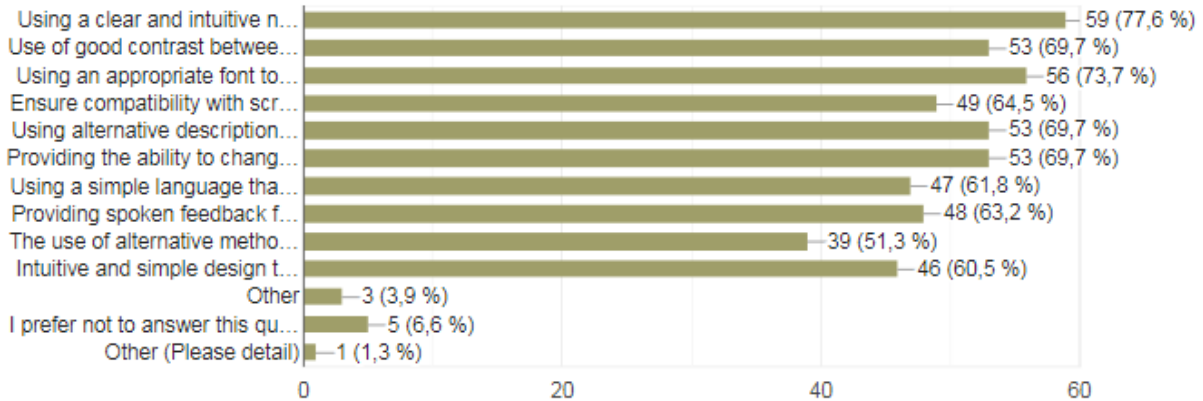
III. Inclusion

1. What inclusion attributes must an IT system dedicated to cultural heritage fulfil to ensure fair inclusion of all categories of users?

The inclusion attributes that an IT system dedicated to cultural heritage must fulfil in order to ensure the fair inclusion of all categories of users are in the view of the respondents the following: Suitability of the CH content to the cultural diversity of the users (65.8%), The development of cultural heritage content suitable for different literacy levels, to avoid discrimination based on ethnicity, social class, gender or religion, etc (64.5%), Expanded capacity to manage, understand & organize information, in order to make CH content accessible for both research and viewing aims (59.2%)
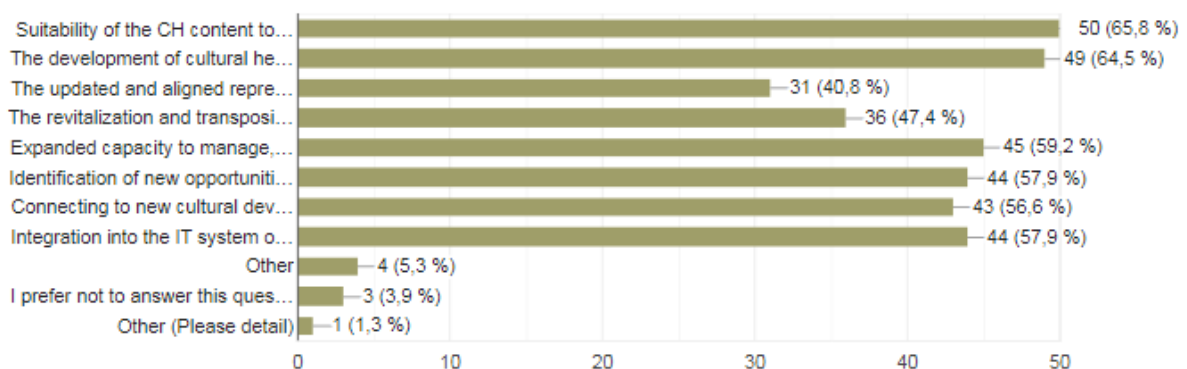
2. By what means can an IT system assisted by AI in the field of cultural heritage ensure the inclusion of the final beneficiaries (tactile images, reproductions/transpositions in bas-relief after famous paintings to be accessible to visual impairment or partially sighted people etc., different software assistants for exploring tactile images or audio descriptions)?

The means by which an AI-assisted information system in the field of cultural heritage can ensure the inclusion of end-users (tactile images, bas-relief reproductions/transpositions after famous paintings to be accessible to the visually impaired or visually impaired, etc., different assistants software for exploring tactile images or audio descriptions) were prioritized by respondents as follows: Information and components of the IT system should be delivered to users in ways that they can receive and understand correctly regardless of any disabilities or physical limitations they may encounter (67 ,1%), The computer system must provide subtitles and other alternatives based on any of the senses (hearing, sight, touch, etc.) to make multimedia universally accessible, without sacrificing meaning (65.8%), while The possibility of performing precise and personalized searches in the cultural heritage collections, as well as the indexing of objects according to different criteria according to the preferences and study/research/documentation objectives of the users (57.9%).
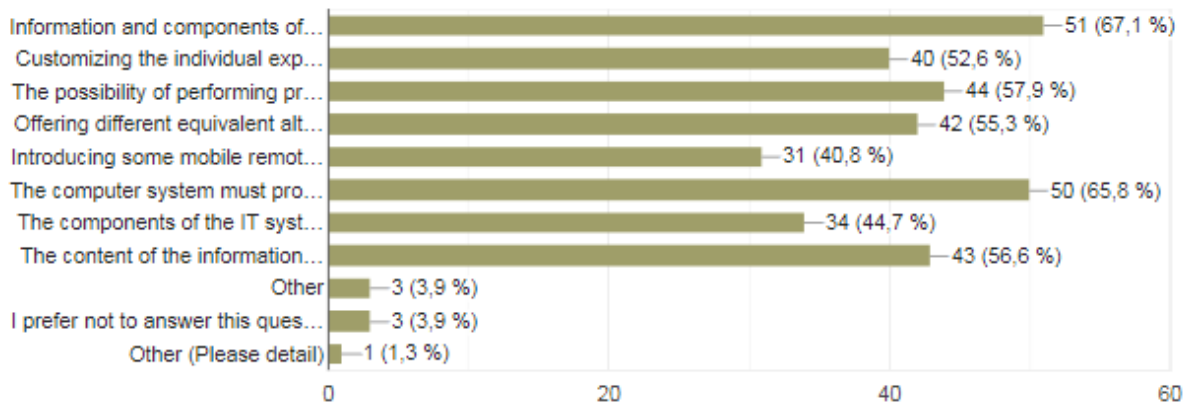
IV. Storytelling

1. What types of digital stories reflecting cultural heritage could be included in an IT system assisted by artificial intelligence?

Types of digital stories that reflect cultural heritage that could be included in an IT system assisted by artificial intelligence are the following according to the

respondents: Stories that present oral or traditional histories collected from local communities (78.9%), Stories like virtual tours that provide information about the cultural heritage of an area, heritage building, museums, libraries, archives, etc. (77.6%), Role-playing stories that involve exploring and learning about cultural heritage by simulating different culturally relevant historical poses and scenarios (72.4%).
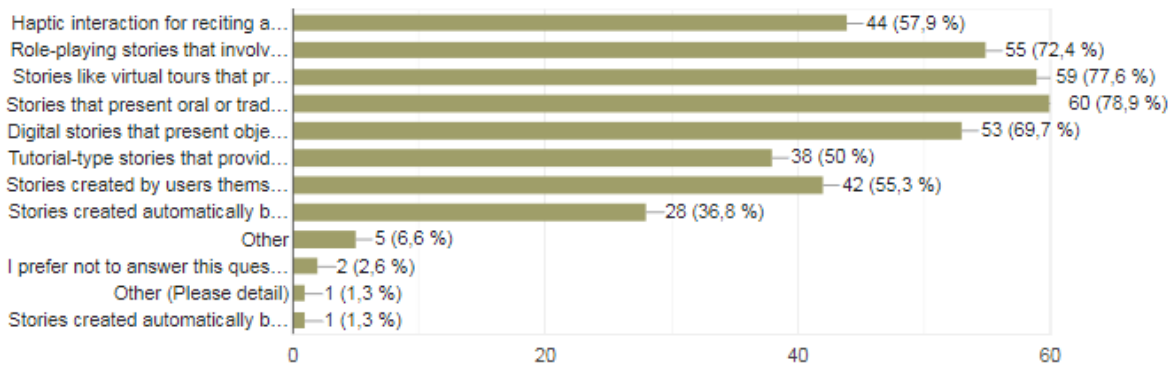
2. What functionalities of connecting with cultural heritage do you consider could be delivered through digital stories within an IT system assisted by AI?

Functionalities of connecting with the cultural heritage that could be provided through digital stories within an IT system assisted by AI are according to the respondents the following: Stories representing descriptions of tangible (photographs, works of art, monuments, etc.) and intangible (landscapes, attributes /approaches/songs, etc.) CH items (77.6%), Stories that increase the emotional impact of CH digital content by integrating musical compositions or suggestive images (76.3%), Stories that reveal in a suggestive way information and experiences of a cultural nature, including their native, historical, social and temporal context (68.4%).
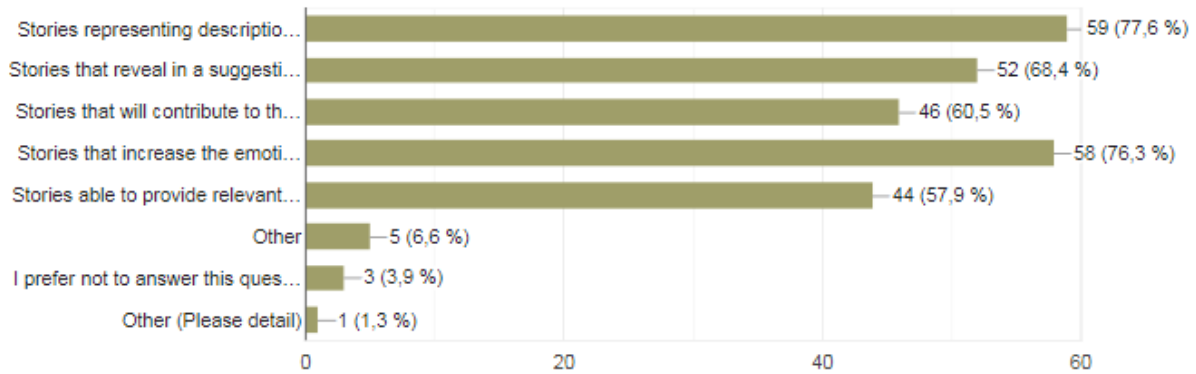
4.2.7 QUESTIONNAIRE ANALYSIS

Analysis of the questionnaire responses yielded valuable findings for the development of the SHIFT technologies, along all four key pillars explored, namely curation, accessibility, inclusion, and storytelling.

Regarding curation, it became clear that technological tools hold a major potential for curatorial work, such as the creation of a collection and its renewal, but also its delivery, management, and communication to the wide audience. In more detail, curatorial systems should provide tools for organizing, semantically anotating, documenting, and filtering CH content, providing associations with digitized CH resources, such as informational content, multimedia, social media content. Furthermore, tools should be provided offering facilities as well as tools employing image analysis through machine learning, video trancription, and automatic translation, thus supporting the efficient aggregation of large volumes of information and the operationalization of the curation work. Technological interventions should ensure the delivery of CH content to the end users in an easy to access, and credible manner through an easy to use and intuitive interface, also supporting content personalization to their preferences. Finally, incorporation of user feedback should be accounted for (e.g. through ratings and comments), as means of communication of the end users with the curators themselves.

In terms of accessibility and inclusivity, tools that were highlighted as important to improve visitor experience to CH included automated virtual guides, automatic translation tools, recommender systems, tools for language adaptation, and tools for automated graphical and audio descriptions of digital CH content. Furthermore, CH content should be delivered through an accessible interface in multiple formats (such as images, text, and audio), supporting multimodal interaction, ensuring

appropriate color contrast and font size, providing alternative text descriptions for non-text content, as well as simple and understandable language. Inclusivity should be further fostered by ensuring that the content delivered is perceivable, operable, robust, diverse, and customizable to user needs. Furthermore, inclusivity was pointed to out to extend beyond accessibility for users with disabilities, catering to additional aspects of user diversity, such as language and culture.

Finally, one important last aspect of CH presentation was that of storytelling. Aspects of storytelling that were appreciated by respondents include the descriptions of tangible and intangible CH elements, revealing information and experiences of a cultural nature, contributing to the recomposition or deciphering of cultural metaphors, increasing the emotional impact of CH, and providing relevant insights cultivating user empathy. Storytelling could be delivered as role-playing stories, virtual tours, traditions or oral stories, tutorial-type stories, as well as user stories reflecting their experiences with CH content and sites.

In conclusion, analysis of the questionnaire responses confirmed findings from best practices and relevant literature and standards, regarding the curation of CH content and its delivery to end users in an inclusive and engaging way. SHIFT technologies shall be developed with the utmost consideration for the requirements elicited, ensuring that the project will adhere the needs, preferences, and expectations of the target audience.

4.3   STAKEHOLDER GROUP: GENERAL PUBLIC END USERS

In addition to the primary stakeholders working within the CH sector, intended to deploy SHIFT technologies for management, curation, processing and mediation of cultural content, the target audience of said content as end-users and primarily consumers represent a different kind of stakeholder. Within the context of the project, the latter group of the target audience manifests as a complex category in need of further differentiation depending on their relationship to the project and its outcomes. Broadly speaking, the target audience is the general public interested in cultural heritage, but with emphasis on the inclusion of vulnerable groups currently excluded from experiencing culture by physiological, sensory, or cognitive barriers (especially the blind and visually impaired group) as well as inclusion or rather activation of groups currently disinterested or otherwise unmotivated to engage with culture. This heterogeneity presents challenges for the project not only in terms of the tools to be developed but also in respect to empirical data. Regardless of how to differentiate the individual subcategories and their partly highly specific needs and interests into primary and secondary

stakeholders and beneficiaries, broken down in more detail in the SHIFT Stakeholder Matrix (already briefly outlined in chapter 4.1 above and below (cf. chapter 4.3.1), an initial challenge rises in how to reach and engage the various target audiences in order to elicit data from them regarding their interests. Unlike the subjects of the stakeholder requirements survey above, a category almost equally heterogenous yet principally united in their shared professional interest in and engagement with cultural heritage, a involvement with the subject matter which typically brings some degree of organisation, neither of these properties can be attributed to the general public aside from the notable exceptions of vulnerable groups, parts of which may be partially organised as (self-)help associations. Whereas potential survey subjects from the CH professional sector and vulnerable groups at least partially in form of their subset of organised members can be reached directly through their various networks, the same is not the case for the diffuse disengaged parties, especially if those will not or cannot participate in Web 2.0 media more conductive to targeted engagement and research.

Related to this is a second issue; the intended end-users are – at least in part – not only more difficult to reach but also more difficult to engage and motivate to participate in research. While all the various groups for the sake of the project conceptualisation can be and are considered stakeholders, their (vested) interest in its outcomes, i.e. their being affected by the SHIFT framework or in turn their willingness to influence its development, must be anticipated to differ greatly. Whereas the future deployers of SHIFT technologies in professional capacities have a direct interest in the project outcomes, the same can be said of some vulnerable groups (such as the blind and visually impaired) within the (sub)category of end users who actively pursue and call for the elimination of barriers and further development of assistive tools to allow them to participate in and experience culture – they therefore can be considered primary stakeholders, too, and can be expected to eagerly contribute data. Unfortunately, the same cannot be stated for those in the general public, who either may be indifferent to research and development because they already can and do pursue their interest in CH without missing something obvious, or else are not interested in CH and thus cannot be expected to have any motivation to engage in research. To minimize aversion, the relation between potential gains and indirect benefits from participating in project-related studies and the distress and necessary effort to do so should fall in favour of the former to ensure productive cooperation.

A third issue in the collection of data stems from the possible intersectionality between the various groups and their interests viewed from different research contexts, or vice-versa how their individual circumstances affect their positions, needs, and decisions. For instance, both CH professionals and visitors (as well as

non-visitors) can be afflicted by disabilities, raising their potential interest in the accessibility aspects of SHIFT. Marginalized groups under threat of social exclusion, e.g. the elderly, may very well be highly interested in CH but be barred for various reasons, not the least of which being intimidated by modern technology, which may prevent them not only from imagining the potential of SHIFT but from participation in digital only surveys. Similar issues might relate to immigrants and their descendants, who may not feel connected to the culture of their new home as well as face language barriers.

It may therefore be necessary to adopt an approach that follows complementary trajectories and methodologies, from one perspective considering the general public as a whole, but from another perspective paying due attention to the specifics of individual sub-groups, especially those less visible and vocal. One group requiring special consideration in the following are the non-visitors of cultural heritage, given the fact that as will be discussed in some cases it cannot even be said that user requirements, i.e. their 'needs' to experience cultural heritage, are theirs but are an external impulse projected onto them by policy makers desiring greater engagement with culture. In other cases, they may have a strong desire for cultural heritage, but are currently barred from experience by personal or external factors.

4.3.1 THE DIVERSITY OF 'NON-VISITORS' TO MUSEUMS AND CULTURAL INSTITUTIONS

Museums and cultural institutions play a crucial role in the preservation, presentation and dissemination of cultural heritage. Despite their importance, there is a significant number of people who do not visit these institutions regularly or at all. The group of 'non-visitors' is diverse.

One aspect of the definition of 'non-visitors' concerns the frequency of visits. There are different degrees of 'non-visitor' groups: There are those who have made a conscious decision to avoid museums (absolute non-visitors) - the abstinent group, possibly due to lack of interest, time or other personal reasons (abstinent non-visitors). There are also people who have visited museums or cultural institutions in the past but do not do so regularly (occasional non-visitors). A further category may include non-visitors who visit museums only on certain occasions or at certain times, such as during special exhibitions or events (seasonal non-visitors).

In order to understand the heterogeneity of this group, demographic and social factors must also be taken into account. Differences in age groups, ethnicity, socio-

economic status and geographical location can strongly influence the decision to visit museums or not. It is important to note that 'non-visitors' are a diverse group and their reasons for not visiting may vary. Therefore, the definition can be adapted depending on the context and research objective. To better understand this group, institutions or researchers can conduct surveys and analyses to identify the specific motivations and barriers of non-visitors [24].

QB4 How many times in the last twelve months have you…? (%-EU)

	Total 'at least once'	None	Don't know
BEEN TO THE CINEMA OR A FILM HERITAGE FESTIVAL TO A CLASSIC EUROPEAN FILM PRODUCED AT LEAST 10 YEARS…	26	73	1
VISITED A LIBRARY OR ARCHIVE (E.G. TO CONSULT MANUSCRIPTS, DOCUMENTS, ANCIENT MAPS ETC.)	30	69	1
VISITED A TRADITIONAL CRAFT WORKPLACE (E.G. WEAVING, GLASS BLOWING, DECORATIVE ART,…	30	69	1
SEEN A TRADITIONAL OR CLASSICAL PERFORMING ARTS EVENT (E.G. MUSIC, INCLUDING OPERA, DANCE OR…	43	56	1
VISITED A MUSEUM OR GALLERY	50	49	1
ATTENDED A TRADITIONAL EVENT (E.G. FOOD FESTIVAL, CARNEVAL, PUPPET THEATER, FLORAL FESTIVAL, ETC.)	52	47	1
VISTITED A HISTORICAL MONUMENT OR SITE (PALACES, CASTELS, CHURCHES, ARCHEOLOGICAL SITES, GARDENS,…	61	38	1

Figure 12 EU study on participation in cultural heritage activities, 2017 [25]

The present EU study, conducted in 2017 as part of the 'Special Eurobarometer 466: Cultural Heritage'[7], provides an insight into the participation of respondents in different cultural activities. While the figures for visits to historical monuments, traditional events, museums and galleries remain above 50%, it is equally important to note the high number of people who do not appear to have participated in such activities.

In this context, it is also interesting to note that participation in cultural heritage activities - such as museum visits, but also in other areas - varies widely across EU Member States:
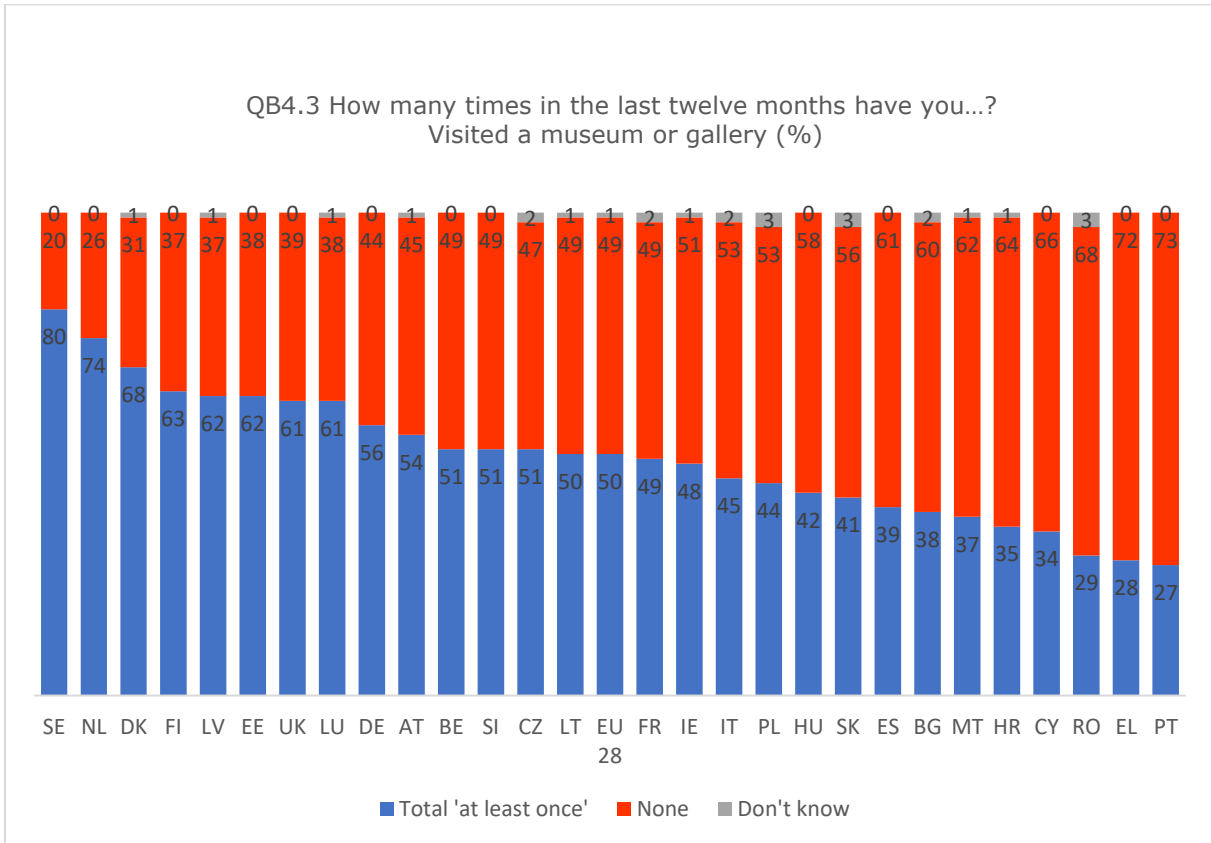
Figure 13 EU study on museum visits in the EU member states, 2017 [26]

DK - Denmark, FI - Finland, LV - Latvia, EE - Estonia, UK - United Kingdom, LU - Luxembourg, DE - Germany, AT - Austria, BE - Belgium, SI - Slovenia, CZ - Czech Republic, LT - Lithuania, EU 28 - European Union (28 Member States, prior to Brexit), FR - France, IE - Ireland, IT - Italy,

The COVID-19 pandemic has also had a significant impact on the target groups of museums and cultural institutions worldwide. Lockdowns, social distancing measures and general uncertainty about health have led to a significant reduction in physical access to museums and a withdrawal from cultural visits. People,

especially the elderly, are reluctant to visit public places and now spend their leisure time at home or in other activities, leading to a decline in visitor numbers. "Previously infrequent or never visitors have lost interest in traditional cultural events. There is also a negative effect on occasional visitors. However, the most significant impact on attendance and capacity utilisation is likely to be the loss of frequent visitors" [27]. The same study also found that people under the age of 30 also feel out of place at traditional cultural events, find the rules of behaviour there rigid and the desire to help shape cultural events is increasing.
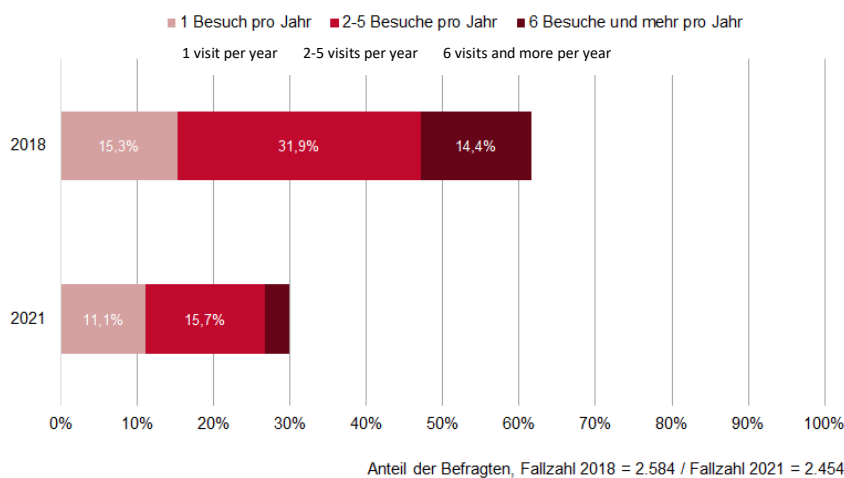
Figure 14 Pandemic-related decline in visitors to museums in Germany [28]

The project "Cultural Education and Cultural Participation in Germany" at the Johannes Gutenberg University Mainz[10] examined the pandemic-related decline in attendance at cultural institutions in Germany in 2021. Overall, a drastic drop in participation can be observed compared to the reference year 2018. Compared to other out-of-home activities, museum visits are the least affected, despite a significant decline of around half during the pandemic. In 2021, almost 30% of the population visited a museum at least once.

On the other hand, the pandemic has accelerated the transition to digital platforms and virtual offerings for museums and cultural institutions. Digital resources are increasingly being used to access works of art, exhibitions and cultural heritage, even when physical visits have been limited. The pandemic has changed the preferences and needs of audiences. Some still prefer digital offerings for

convenience and flexibility, while others are looking for personalised, immersive experiences.

Overall, the lingering effects of the pandemic have changed the way people experience and consume culture. Museums and cultural institutions need to adapt to these changes in order to continue to effectively reach and engage their target audiences and attract new ones. Increased use of digital technologies and sensitivity to the needs of target audiences will be crucial.

4.3.2 BARRIERS TO ACCESSING CULTURAL SERVICES IN MUSEUMS, LIBRARIES AND CULTURAL INSTITUTIONS

Several barriers can prevent people from accessing cultural services in museums and libraries [29].

1. Financial barriers:

Entrance fees and costs for cultural events can be a barrier for many people, especially for families with limited incomes. The perception that cultural institutions are expensive may lead some people to avoid them in the first place.

2. Lack of information:

Lack of knowledge about cultural programmes and events in museums and libraries can be a barrier. If people do not know what is on offer or what exhibitions are taking place, they are less likely to participate actively.

3. Lack of accessibility:

Museums and libraries should be designed to be accessible to people with physical limitations or disabilities. The lack of lifts, ramps or other facilities for disabled people, lack of audio descriptions, sensory experiences, layered information, large print and other different aspects of intellectual, sensory, economic and phisical accessibility can be a barrier.

4. Cultural distance:

Some people may feel distanced from cultural institutions, believing that they are not part of the target audience or that the content is not relevant to them. A wider range of exhibitions and events could help to appeal to different interests and backgrounds.

5. Lack of cultural education:

Access and early exposure to cultural opportunities in childhood and adolescence are critical to developing a deep understanding of and interest in museums and libraries. Early cultural experiences shape perceptions and foster a lifelong commitment to cultural activities.

6. Time constraints:

Lack of time is often a factor that prevents people from taking advantage of cultural opportunities. Long working hours, family commitments and other time constraints can make it difficult to attend cultural events.

7. Geographical distance

Geographical distance and the limited availability of cultural heritage sites or activities in certain regions are significant barriers to access. This makes it difficult for many people to participate in cultural activities, either because they have to travel long distances or because they have limited cultural opportunities in their immediate neighbourhood.

8. Lack of diversity of representation:

If the representation in museums and libraries is not diverse enough and different perspectives, cultures and histories are not adequately represented, some visitors may not feel engaged.

9. The Digital Gap:

In an increasingly digital world, people without access to technology or with limited digital skills may struggle to benefit from online resources and virtual offerings from cultural institutions.

The aforementioned 2017 EU study (Special Eurobarometer 466: Cultural Heritage) [30] concludes that lack of time is the most common barrier to accessing cultural heritage sites or activities (37%), while more than a third cite cost (34%) and 31% lack of interest. Lack of information is a barrier for a quarter (25%). More than one in ten say that heritage sites or activities are too far away or difficult to reach for them, or that there is no or only a limited choice of heritage sites or activities in their area (both 12%). Less than one in ten say that the quality of heritage sites or activities in their region is poor (6%).
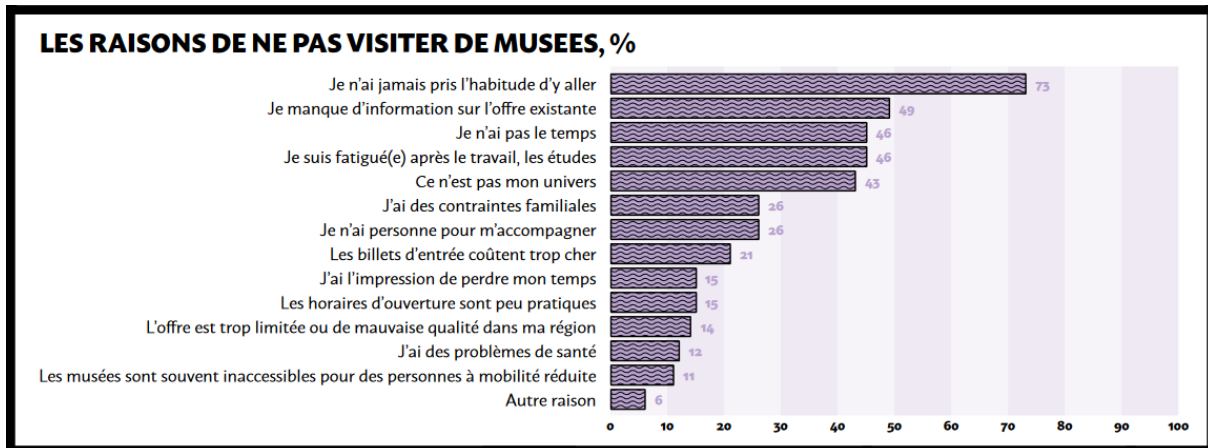
Figure 15 Study by the Ministry of Culture of Luxembourg on non-visitors to museums, 2021 [31]

The study on non-visitors to museums between March 2019 and March 2020, carried out on behalf of the Luxembourg Ministry of Culture, also reveals telling results. Among the population, 40% have not visited a museum during this period.

The most frequently cited reason for not visiting museums is "lack of habit" (75%). According to the study, this is due to a lack of access to and a lack of exposure to cultural offerings during childhood and adolescence. The second most common reason (49%) was a lack of information about what was available. Other important reasons were lack of time (46%), exhaustion after work or study (46%) and the feeling that museums are not part of their own world (43%). The study also shows that financial issues play a role, with 21% saying that tickets are too expensive. Family commitments (26%) and the lack of a companion (26%) also play a role.

Overcoming these barriers may require a combination of financial support, improved communication, inclusive design of facilities, targeted programme development and other measures to ensure that cultural provision is accessible and engaging for the wider population. The SHIFT Tools can also make a lasting contribution to making museums and cultural institutions more attractive to new audiences.

4.3.3 HOW CAN THE SHIFT TOOLS CONTRIBUTE TO THE DEVELOPMENT OF NEW TARGET GROUPS FOR MUSEUMS AND CULTURAL INSTITUTIONS, ESPECIALLY THOSE WHO HAVE PREVIOUSLY BEEN CONSIDERED 'NON-VISITORS'?

The innovative SHIFT project, based on advanced technologies, offers a promising opportunity to reach new audiences for museums and cultural institutions, especially those previously considered 'non-visitors':

- By using haptic interfaces and accessible technologies, museums can improve their accessibility for people with disabilities. This creates a more inclusive environment and appeals to a previously neglected audience.

- Artificial intelligence and machine learning enable the creation of personalised visitor experiences. By customising tours, recommendations and interactive content, museums can engage visitors who may have previously had little interest in standardised offerings.

- Digital content transformation methods allow museums to transform their collections into innovative digital formats. This can include online exhibitions, interactive presentations and virtual tours that appeal to a wider digital audience.

- Analysis of historical records can help to present cultural stories in a variety of ways, including linguistic diversity. This could appeal to people who have previously felt underrepresented.

- By processing different data formats, such as text, images and audio, museums can create more engaging and diverse exhibitions. This could attract a wider range of visitors who have different preferences for receiving information.

- The project could be used to build partnerships with communities, schools and organisations for people with disabilities. This will encourage greater participation and allow museums to respond to the needs of these communities.

- Through the use of digital platforms and interactive content, museums can build online communities. This enables exchange and interaction with people who may not be able to be physically present due to distance or other barriers.

- The project itself can be used as an outreach tool. The integration of new technologies can be used to engage non-visitors and increase the attractiveness of museums to a wider audience.

By implementing these approaches holistically, museums and cultural institutions can reach new audiences and encourage previous 'non-visitors' to discover the cultural experience in an innovative and inclusive context.

4.3.4 HOW CAN THE INDIVIDUAL SHIFT TOOLS HELP TO OVERCOME EXISTING BARRIERS FOR 'NON-VISITORS' TO MUSEUMS AND CULTURAL INSTITUTIONS?

The SHIFT Tools form an innovative technology platform that can help overcome existing barriers for 'non-visitors' to museums and cultural institutions. These technologies are designed to create a more inclusive and interactive cultural experience that recognises different senses and needs.

The tools can remove barriers for people with different abilities and interests, promoting inclusion and enabling 'non-visitors' to have an enriching cultural experience. Combining artificial intelligence, machine learning and other innovative approaches, these tools provide a bridge between tradition and modern technology to make cultural heritage accessible to all.

- The Accessible Text-to-Speech (TTS) tool enables people with visual impairments to access written content, be it in books or descriptions of artworks. The integration of audio descriptions enhances the cultural experience (not only) for visually impaired people.

- The Haptic Interaction tool transforms physical objects into digital ones, allowing visitors to experience cultural artefacts through the sense of touch. This is particularly beneficial for people with visual impairments, giving them an alternative way to explore works of art and historical artefacts.

- The Accessibility Framework provides a comprehensive, intuitive and accessible platform for all visitors, including people with disabilities. It enables multimodal narratives about cultural artefacts that cater for different learning styles and preferences.

- The Contemporary Translation tool provides a link between historical content and contemporary language. This helps younger generations and people who may not understand historical jargon to better understand the meaning and relevance of cultural artefacts.

- The Audio Narrative tool automatically provides additional information about cultural artefacts, whether in books, paintings or photographs. This makes it easier

for all visitors, regardless of background or education, to understand and appreciate the exhibits.

4.3.5 THE USE OF SHIFT TOOLS IN SELECTED EXAMPLES OF PREVIOUSLY UNTAPPED OR POORLY TAPPED TARGET GROUPS ('NON-VISITORS')

Table 2 and following: SHIFT tools and non-visitor target groups

Target Group:	**Young adults and millennials**
Reasons:	Exhibitions and programmes not perceived as relevant or appealing to this age group. Lack of use of digital platforms to engage them.
Needs:	Interactive and experiential exhibitions, digital interactions, events and programmes that are contemporary and relevant.

SHIFT Tools:	**Image to Video:** This feature can be used to create engaging short videos from photos and paintings. By incorporating dynamic visual elements and modern music, museums can present their exhibitions in a contemporary and entertaining way.
	Video to Speech: This tool converts visual stimuli into audio content. Museums can provide visual explanations and interpretations of exhibits in the form of audio guides or podcasts to appeal to young adults and millennials.
	Haptic Interaction: Transforming physical objects into digital formats through haptic interaction allows for an interactive experience that can pique the curiosity of young adults. The ability to explore 3D digital cultural assets locally or remotely offers an innovative approach and can encourage interaction with the exhibits.
	Audio Narrative: By automatically generating additional information about cultural assets in the form of audio commentary or stories, museums can create a more narrative experience. This appeals to young adults, who are often looking for engaging and easily accessible information.
	Contemporary Translation: Translating historical meanings into more contemporary language helps to break down the barriers between traditional forms of expression and modern understanding. This makes the content more accessible and relevant to young adults.
	Accessibility Framework: A comprehensive, intuitive and accessible multimodal storytelling tool can help make the cultural experience more engaging for young adults. By integrating different formats such as audio, video and text, museums can offer a versatile and engaging presentation of their content.

Target group:	**Families with children**

Reasons:	Perceived challenges such as lack of child-friendliness in exhibitions and limited family-friendly activities, which may lead this group to prefer alternative leisure options.
Needs:	Family friendly exhibitions, interactive games, learning materials for children, safe and accessible environments.
SHIFT Tools:	**Image to Video:** This tool can be used to create interactive and animated videos from photos and paintings that are particularly appealing to children. These visual stories can help capture children's attention and engage them in the cultural experience. **Haptic interaction:** Transforming physical objects into digital formats with haptic interaction allows children to explore cultural artefacts in a tactile way. These haptic experiences can stimulate children's curiosity and create an interactive environment. **Audio Narrative:** The Audio Narrative tool can be used to present stories and information about the cultural heritage in child-friendly and easy-to-understand formats. Audio guides or narratives can be tailored specifically to the age group of children. **Accessibility Framework:** The comprehensive and accessible Accessibility Framework can be used to create interactive and easy to understand multimodal narratives. The integration of different formats can help hold children's attention and enrich their learning experience. **Accessible Text-to-Speech (TTS):** The Accessible Text-to-Speech (TTS) tool can be used to read the content of books, descriptions of photographs and paintings by curators in a child-friendly way. This supports children who may not be able to read for themselves and makes the content more accessible.

Target group:	**Senior citizens**

Reasons:	Lack of specific adaptations, such as comfortable seating, slower speed of tours, and age-appropriate interactive offerings
Needs:	Barrier-free access, seating, guided tours at a moderate pace, exhibitions that evoke memories and events that allow social interaction.
SHIFT Tools:	**Audio Narrative:** The Audio Narrative tool can be used to automatically provide additional information about cultural assets that evoke memories. Audio narratives can be specifically designed to present stories and contexts that create a nostalgic connection to historical records. **Contemporary Translation:** Contemporary translation can translate historical meanings into easy-to-understand language specifically tailored to the experiences and understandings of older people. This encourages a deeper connection with the cultural content. **Accessibility Framework:** The comprehensive Accessibility Framework can be used to provide multimodal narratives about cultural assets that are accessible to people with different abilities. This can improve interaction and understanding for older people. **Accessible Text-to-Speech (TTS):** The Accessible Text-to-Speech (TTS) tool can be used specifically for people with visual impairments to read content from book resources and descriptions of photos/paintings. This makes it easier for older people to access written information. **Haptic Interaction:** Haptic Interaction can convert physical objects into digital formats and use the sense of touch to create an interactive experience. This allows older visitors to explore cultural assets in a tactile way and promotes usability.

Target group:	**Personae with disabilities**

Reasons:	Lack of accessible facilities, lack of special programmes and resources to meet their needs.
Needs:	See chapter 6 'User requirements of Personae with disabilities'
SHIFT Tools:	See chapter 6 'User requirements of Personae with disabilities' - Table 1: How, where and by whom SHIFT Tools are used.

Target group:	**Tourists**
Reasons:	Lack of multilingual signage and information, limited foreign language guided tours.
Needs:	Multilingual information, flexible opening hours, special tourist tours that convey local history and culture.
SHIFT Tools:	**Audio Narrative:** The Audio Narrative tool can be used specifically for tourist tours. Automatically generated audio narratives offer a flexible way to provide information about local history and culture without having to rely on specialised guides. **Accessibility Framework:** The Accessibility Framework can be used to provide multimodal narratives about cultural assets that are accessible for different needs and languages. This allows for a flexible and inclusive presentation of information to tourists. **Image to Video:** Converting photos and paintings into short videos using the Image-to-Video tool can provide a visually engaging way to introduce tourists to local history and culture. This can also be used as promotional material for tourist attractions. **Accessible Text-to-Speech (TTS):** The Accessible Text-to-Speech (TTS) tool can assist tourists with visual impairments by reading content from book resources, descriptions of photos and paintings. This ensures an accessible presentation of information.

Target group:	**Digital Target Groups**
Reasons:	Lack of use of digital platforms, limited online exhibitions and interactive offerings.
Needs:	Virtual tours, online exhibitions, interactive applications, social media activities, digital educational materials.
SHIFT Tools:	**Video to Speech:** The Video to Speech tool can be used to convert visual stimuli into audio content that serves as a podcast or listening experience for online exhibitions. This allows digital audiences to access content without visual elements. **Audio Narrative:** The Audio Narrative tool provides the ability to automatically provide additional information about cultural assets. This can be used for virtual tours and online exhibitions to provide an engaging audio narrative that gives digital visitors an interactive insight. **Accessibility Framework:** The Accessibility Framework can serve as a comprehensive tool for digital audiences by enabling multimodal narratives about cultural assets. These can be easily integrated into interactive applications and digital educational materials. **Contemporary Translation:** Contemporary translation can be used to translate historical meaning into contemporary language, thereby promoting digital comprehension. This is particularly important for online exhibitions and digital educational content. **Haptic Interaction:** Although haptic interactions were originally designed for physical interactions, the conversion of physical objects into digital formats can also be used for virtual tours and interactive applications. This creates a unique digital experience.

Target group:	**Working People**
Reasons:	Limited opening hours, lack of evening or weekend events accessible to working people.
Needs:	Evening opening hours, weekend events, short, focused exhibitions that can be explored in a short space of time.
SHIFT Tools:	**Image to Video:** The Image to Video tool can be used to convert photos and paintings into short, engaging videos. This allows for a quick presentation of cultural content that working people can explore in a short amount of time. **Audio Narrative:** The Audio Narrative tool provides the ability to automatically provide additional information about cultural assets. Through short, informative audio narratives, working people can quickly obtain relevant information during their visit. **Accessibility Framework:** The Accessibility Framework can serve as a comprehensive tool for working people by enabling multimodal narratives about cultural heritage. Flexible and accessible forms of presentation allow people with limited time to explore cultural content efficiently. **Haptic Interaction:** Although haptic interactions are primarily intended for physical interactions, the transformation of physical objects into digital formats can also be used for short and focused exhibitions. This creates a unique and efficient experience. Adjusting opening hours and organising weekend events takes into account the schedules of working people. Digital tools can support this by providing access to cultural content outside of regular working hours.

Target group:	**Local communities in peripheral areas/community-based target groups**

Reasons:	Limited transport links, insufficient promotion of events in these communities, lack of relevance of exhibitions to the local population.
Needs:	To ensure affordable and reliable transport links to cultural venues. Community events, participatory programmes that highlight local history and culture.
SHIFT Tools:	**Contemporary Translation:** The Contemporary Translation tool allows historical information to be translated into contemporary language. This facilitates the communication of cultural content, making it more relevant and understandable to the local community. **Audio Narrative:** The Audio Narrative tool can be used to automatically provide additional information about cultural objects. These audio narratives can include locally relevant stories and background to engage the community. **Image to Video:** The Image to Video tool can be used to showcase local events and activities in short videos. This can draw attention to cultural events and encourage the local community to engage more with what is on offer. **Accessibility Framework and Accessible Text-to-Speech (TTS):** By combining accessible text and audio, information about local exhibitions and events can be made more accessible. This is particularly important where local advertising is limited. **Haptic Interaction:** Haptic interaction can be used to convert local artefacts and objects into digital formats. This provides an interactive experience that engages local communities and strengthens their cultural identity.

4.3.6 SHIFT USER REQUIREMENTS METHODOLOGIES

From the above, it is evident that empirical research into (end) user requirements faces challenges in adequately framing the diversity of groups, their specific needs,

how to balance their differing value attributions regarding absolute necessities in terms of accessibility and inclusion versus the mere potential enhancements of experience for in-groups such as traditional CH visitors. An additional challenge to be overcome remains in identifying and then reaching the members of the more elusive or reluctant silent groups for their input in the first place. For these reasons, it appears prudent to deploy alternative strategies compared to other stakeholder groups and follow multiple trajectories for empirical data collection.

One solution is incremental data collection, initially in broad strokes, subsequently followed by more targeted, more in-depth research. A first end user survey should be developed to both capture vital data on accessible demographics and their relationship to cultural heritage in contexts most relevant to SHIFT, as well as should capture the attention of survey participants about the project. Treating this initial survey simultaneously as a form of promotional tool to introduce the project and its planned set of technologies to general public participants, we can test the waters on initial response and interest, and ideally collect contact information for further promotional material distribution and/or willingness to participate in more detailed potential follow-up research (such as more in-depth and/or targeted surveys, focus groups, pilot demos, etc.). To achieve widest and reasonably balanced distribution, and more importantly actual participation, the following properties are recommended for survey design:

a.) the survey if this stage should be reasonably brief, to avoid intimidation or demanding too much time and effort to complete (reducing willingness to participate in the first place)

b.) the survey should be held in simple terms and language, again to avoid intimidation or avoid confusion of participants; the obvious trade-off is specificity and detail of resulting data, to be compensated by subsequent more targeted and in-depth surveys

c.) a mix of communication channels, media and distribution locations is essential balanced representation; if for instance one of the central issues of inclusion are barriers that prevent some groups from participating in cultural heritage experience, the same barriers cannot be allowed to likewise exclude their positions on it, their needs and feedback[14].

d.) the survey should be designed to include a necessary minimum of subtle questions that allude to the various possible end user segments or their specific

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[14] This may sound paradoxical to the digital focus of the project and a desired progress narrative, as well as antithetical to ecological concerns, but in this case the inclusion aspects outweigh other aspects.

contexts and needs; these serve as touchstones to be able to align the results of this survey to subsequent more target-specific surveys.

It is strategically sensible that a sample as wide as possible should be reached to gauge a first impression. However, it is equally reasonable that a brief but wide survey risks superficiality if not elimination of crucial details and their potential correlations. To counter this risk, a series of more detailed surveys will be designed for and circulated to specific segments of the target audience, ideally including appropriate participants who declared their willingness in the first survey. The final selection of specific target audience segments will be determined by results of the preceding broad survey; likely candidates emerging from the theoretical breakdown outlined in the prior chapter above are young people, elderly people, persons with disabilities, digital target groups, and a control group of regular CHI visitors. Given that the more specific target context allows a more directed engagement with potentially personal relevance to the target participants, it can be anticipated that the risk of alienation is lower and a greater willingness to spend time and effort in participation is likelier, allowing for a more extensive and more complex catalogue of questions. The recommended survey design should therefore:

a.) complement and deepen the insights of the preceding Survey

b.) give ample room to differentiate problematic factors specific to group

c.) address potential barriers both theoretical and practical against SHIFT examples [ideally taken from SHIFT pilots]

d.) allow for value-relative responses and comparative scales (e.g. Likert)

e.) provide varied response choices, avoid free form answers (to ensure comparative results), employ freeform answer options separately

The objective here is twofold: the first is to gain critical understanding of the specific target groups relationship to cultural heritage and their needs to experience it. the first is to gain critical understanding of the specific target groups relationship to cultural heritage (i.e. how it can be reinforced) and their needs to experience it. The second objective is to capture how specifically the SHIFT concepts might conceivably impact and enhance their experience, and what their expectations are. The latter points will supply critical input for the further development of the tools in the right direction and validate the sane. Additionally, this should create datasets of expectations which can later serve as comparative data during the evaluation stage of tool testing during pilots or intermediate small-scale prototype sessions.

4.4 UPCOMING RESEARCH ACTIONS

Priority status is held by the development of further empirical research into end user needs and requirements focusing on CH non/visitors. Next steps here are:

- a brief, broad survey to maximize visibility, participation and future research engagement; currently under development
- distribution of this survey and evaluation of results
- identification of the most critical subsegments within the sample, development of a series of more in-depth, targeted follow-up surveys; currently in development anticipating expected results. Will likely need adjustment and determining further targets once results of prior survey are in.
- further collection of relevant external empirical data to have comparative datasets. Sporadic and locally isolated findings so far, for instance a survey on young Romanians and their relatively valued relationship with cultural activities suggests care will be necessary in differentiated data processing to avoid reinforcing stereotypes.

More distantly, it will need to be determined whether a continuation of the existing early CH expert stakeholder survey is deemed beneficial, desirable or necessary, and warrants further resources whether as a relaunch or in revised form. A relaunch at this later stage would benefit from the progress gone into the SHIFT tools development, meaning a clearer and more tangible image of the proposed SHIFT outcomes that can be introduced to survey subjects. This necessary progress in the project timeline towards the ability to show actual product prototypes has been the reason why end user surveys have been postponed after CH expert stakeholder research, but it is probable that a relaunch of the latter can benefit from the same progress.

At any rate, it is evident from evaluation of the early empirical data, that reaching a solid number of responses to serve as a representative and balanced dataset regardless of target group to avoid statistical artefacts that have surfaced in the preliminary results, for instance in the gender inequality within the sample (approx. 70% to 30% female to male participants, presumably caused by a combination of regional as well as occupational factors in a limited dataset, given the low number of around 70 responses out of circa 250 persons contacted). For

this reason, reaching a minimum of 300 survey respondents should be a priority goal.

In addition to the already planned empirical research efforts just outlined above, it appears sensible to remain flexible and open to alternative ways to gather input from specific target audiences when and where the need arises, or the opportunity arises. Such activities may include but are not limited to: interviews of CH visitors, forming of focus groups, impromptu small-scale pilots or prototype testing, etc. Examples of such activities already conducted or ahead are for instance the invitation of and discussion with representatives of affected end user groups during consortium meetings (educators, journalists in Budapest, March 2023; blind and visually impaired academics and citizens in Knjaževac, June 2023) or preliminary prototype testing of the VR/haptics framework with blind and visually impaired partners and public (Berlin, September 2023). Similar future opportunities should be anticipated or be actively instigated.

Eventually, the project timeline will reach the planned exhibition cases (anticipated to take place between M18-M36 as per the DoA) and shift into the evaluation stage; that said, the transition can be considered fluent (arguably the VR/haptics test in September 2023 serves both as an early evaluation of the framework prototype for its developers and from the perspective of WP1 an opportunity to ask and validate user requirements for broader application). Refinement of user requires is therefore possible, at least in principle, throughout the later stages of the project, even though nominally the final deliverable on User Requirements per se will be published in M21, June 2024.

5. USER EVALUATION AND ACCEPTANCE METRICS

This section discusses approaches and methods to conduct user evaluation studies for the SHIFT tools and in a second step examines suitable acceptance metrics to retrieve data about the success of the tools from the evaluation datasets. The first iteration of this deliverable (D1.1) will concentrate on the four use case pilots slated to test the SHIFT tools with stakeholders in exhibition cases (EC 1 through 4) outlined in WP5 T5.5 between M18 and M36 as the project's immediate concern, and will outline broader and more general application to be revisited and further fleshed out in the second iteration of this deliverable (D1.4) due in M21 once the data from the pilots is available for analysis.

5.1 USER EVALUATION

To measure the success of the tools, user evaluation studies will be conducted during the course of the project and should be set up in a manner that allows the continued growth monitoring past the project timeline by providing a framework for comparative analysis of data accumulated over the tools' life cycle. Considering the loosely interconnected but decoupled nature of the set of tools, it is crucial to establish a cohesive frame of reference, for which the following sections will work out guidelines.

5.1.1 GENERAL CONSIDERATIONS AND CRITERIA FOR ACCESSIBILITY

First of all, criteria for evaluating accessibility will need to be discussed. The already available standards and best practice examples discussed above in chapter 2.2 will provide a backbone for this. It needs to be reiterated and stressed that although the user evaluation should of course take into account and reflect general response to the tools also, the main focus rests on their success to facilitate and improve accessibility and inclusion, so this takes a priority role. This in itself presents a challenge as far as disability, i.e. that which necessitates accessibility in the first place, is an inherently complex and diverse category. The degree to which disability barriers are overcome needs to therefore be evaluated in a differentiating manner depending on type of disability and context rather than in broad strokes. Although the SHIFT outcomes may be useful to a broader audience,

considering that SHIFT use cases will be assessed with users with visual impairments, this section will mainly focus on guidelines and criteria that aim to ensure accessibility of interactive technologies for this specific target user group.

A renowned source of accessibility guidelines is the WCAG Guidelines by W3C/WAI [32]. The WCAG provides a framework to test and judge the compliance to its standards and thus the accessibility of web content, which potentially can be adapted to non-web content as their projects WCAG2ICT and W3C XR underscore. Conformance testing follows a threefold strategy: functional testing, usability testing, and success criteria. Usability testing is recommended to include testers with disabilities to determine practical performance. WCAG provides concrete success criteria, a list of 78 (as of WCAG 2.1) scenarios in which users with disabilities are disadvantaged if criteria are not met. Furthermore, it provides a list of techniques, general and technology-specific, classified into two main categories: sufficient and advisory techniques; 'sufficient' techniques ensure conformance with the accessibility criteria, whereas 'advisory' may offer improved user experience. Furthermore, WCAG provides a list of 'failures', that is documented failed tests, offering insight into what to avoid beforehand. It should be noted that techniques are informative, that is they are offered as helpful guides to assist developers in achieving accessibility, however, they are not mandatory if success criteria can be fulfilled by alternative means. Compliance with the WCAG is distinguished into three levels A, AA, AAA) according to factors such as how well success criteria are met, how well integrated techniques and measures are, what their use requires and entails, etc.

WCAG 2.1 are built on four main pillars, each featuring different accessibility guidelines and criteria. Table 3 below summarizes the criteria applicable to SHIFT, considering the target user group and context of use.

Table 3. WCAG 2.1 criteria applicable to SHIFT

Pillar 1: Perceivable		
Guidelines	**Criteria**	**Conformance Level**
Text Alternatives	Non-text Content	A
Time-based Media	Audio-only and Video-only	A

	Audio Description or Media Alternative (Pre-recorded)	A
	Audio Description (Pre-recorded)	AA
	Extended Audio Description (Pre-recorded)	AAA
	Audio-only (Live)	AAA
Adaptable	Info and Relationships	A
	Meaningful Sequence	A
	Sensory Characteristics	A
	Orientation	AA
	Identify Input Purpose	AA
	Identify Purpose	AAA
Distinguishable	Use of colour	A
	Audio Control	A
	Contrast (Minimum)	AA
	Resize text	AA
	Images of text	AA
	Contrast (Enhanced)	AAA
	Low or No Background Audio	AAA
	Visual Presentation	AAA
	Images of Text (No Exception)	AAA
	Reflow	AAA
	Non-text Contrast	AA
	Text Spacing	AA
	Content on Hover or Focus	AA
Pillar 2: Operable		

Guidelines	Criteria	Conformance Level
Keyboard Accessible	Keyboard	A
	No Keyboard Trap	A
	Keyboard (No Exception)	AAA
	Character Key Shortcuts	A
Enough Time	Timing Adjustable	A
	Pause, Stop, Hide	A
	No Timing	AAA
	Interruptions	AAA
	Re-authenticating	AAA
	Timeouts	AAA
Seizures and Physical Reactions	Three Flashes or Below Threshold	A
	Three Flashes	AAA
	Animation from Interactions	AAA
Navigable	Bypass Blocks	A
	Page Titled	A
	Focus Order	A
	Link Purpose (In Context)	A
	Multiple Ways	AA
	Headings and Labels	AA
	Focus Visible	AA
	Location	AAA
	Link Purpose (Link Only)	AAA
	Section Headings	AAA

Input Modalities	Pointer Gestures	A
	Pointer Cancellation	A
	Label in Name	A
	Motion Actuation	A
	Target Size	AAA
	Concurrent Input Mechanisms	AAA

Pillar 3: Understandable		
Guidelines	**Criteria**	**Conformance Level**
Readable	Language of Page	A
	Language of Parts	A
	Unusual Words	AAA
	Abbreviations	AAA
	Reading Level	AAA
	Pronunciation	AAA
Predictable	On Focus	A
	On Input	A
	Consistent Navigation	AA
	Consistent Identification	AA
	Change on Request	AAA
User Assistance	Error Identification	A
	Labels or Instructions	A
	Error Suggestion	AA
	Error Prevention (Legal, Financial, Data)	AA
	Help	AAA

	Error Prevention (All)	AAA

Pillar 4: Robust		
Guidelines	**Criteria**	**Conformance Level**
Compatible	Parsing	A
	Name, Role, Value	A
	Status Messages	AA

Considering that SHIFT will deliver an accessible immersive CH experience to end users, demonstrating how the SHIFT tools can leverage interaction with CH and make it inclusive, guidelines that are also applicable are those pertaining to XR accessibility. W3C has set up a working group on XR accessibility user requirements, which has recently produced a document [33] on user needs and requirements for people with disabilities when using virtual reality or immersive environments. Requirements relevant to the SHIFT objectives and context of use are summarized and briefly explained in Table 4.

Table 4. User requirements for accessibility in XR environments

User requirement	**Details**
Immersive semantics and customization	A user of assistive technology wants to navigate, identify locations, objects and interact within an immersive environment.
Motion agnostic interactions	A person with a physical disability may want to interact with items in an immersive environment in a way that does not require particular bodily movement to perform any given action.
Interaction and target customization	A user with limited mobility, or users with tunnel or peripheral vision may need a larger 'Target size' for a button or other controls.
Colour changes	Colour blind users may need to be able to customise the colours used in the immersive environment. This

	will help with understanding affordances of various controls or where colour is used to signify danger or permission.
Magnification context and resetting	Screen magnification users may need to be able to check the context of their view in immersive environments.
Critical messaging and alerts	Screen magnification users may need to be made aware of critical messaging and alerts in immersive environments often without losing focus. They may also need to route these messages to a 'second screen'
Gestural interfaces and interactions	A blind user may wish to interact with a gestural interface, such as a virtual menu system.
Immersive time limits	Users may be adversely affected by spending too much time in an immersive environment or experience and may lose track of time.
Orientation and navigation	A screen magnification user or user with a cognitive and learning disability or spatial orientation impairment needs to maintain focus and understand where they are in immersive environments.
Second screen devices	Users of assistive technology such as a blind, or deaf-blind users communicating via a RTC application in XR, may have sophisticated 'routing' requirements for various inputs and outputs and the need to manage same.
Avoiding sickness triggers	Users with vestibular disorders, Epilepsy, and photo sensitivity may find some interactions trigger motion sickness and other affects. This may be triggered when doing teleportation or other movements in XR.
Captioning, Subtitling and Text: Support and customization	Users may need to customise captions, subtitles and other text in XR environments.

In addition to the above, the XR Association, an association that includes headset manufacturers, technology platforms, component and peripheral companies, internet infrastructure companies, enterprise solution providers, and corporate end-users, has produced a set of guidelines [34] for developers for creating accessible and inclusive immersive experiences. These guidelines are organized per category. The current deliverable summarizes general accessibility guidelines, and guidelines pertaining to the interaction needs of users with visual impairments, as provided in Table 5.

Table 5. XR accessibility guidelines by the XR Association

Category	Guideline	Details
General	Removing or reducing background details and audio	By providing users the option to remove or reduce background visual and audio detail, users may better distinguish the most important activities or tasks in the application.
	Undo/Redo functions	Regardless of disability, all people make mistakes when using X R platforms and apps. Allowing users to undo or redo actions they have made in error or because of imprecision would aid all users but is especially helpful to improve the experience for users with physical, cognitive, visual or hearing disabilities.
	Reducing speed and setting up action sequences	Users may at times have difficulty quickly and accurately reacting to prompts. To enable user progress, it may be helpful to allow users to reduce the speed of the app or to increase the time allotted for making decisions or completing challenges.
	Bypass functions	Adding a bypass function would permit users to skip challenging or timed experiences while still allowing them to progress in the app

	Save progress	A function that allows users to save their progress at any time to avoid the need to repeat challenging actions or simply to allow them to pick up on the experience where they left off
Visual Accessibility	Altering the size of objects, elements and texts	This includes functionality for magnification, changing fonts, contrast, foreground and background colours of text, brightness levels, and enabling peripheral maps.
	Audio augmentation and text to speech	Audio augmentation is an important feature that should be available to users with vision loss. Text-to-speech (TTS), also known as "read aloud," programs may work especially well to ensure that users who otherwise cannot read text instructions, labels, or other written elements in an app are able to understand and interact with the app effectively.
	Colour filters and symbols	To support users that cannot discern colour, developers should either allow users to recolour the interface and objects, provide shapes or symbols alongside meaningful colours, or provide textures on objects or elements to help distinguish information in app
	Scrim or scrim-like overlays	Where other methods of making text more readable — such as blurring underlying images or using text boxes — can obscure background information and elements, a scrim's semi-transparent layer still allows the user to see the image or object behind it, while providing text that is readable.

5.1.2 METHODOLOGIES

SHIFT will follow the Human-Centered Design approach (35) involving end-users in the development lifecycle of the produced technologies, by assessing incremental prototypes and providing feedback regarding their usability and usefulness. At the same time, aiming to ensure that the technologies tested by users are barrier-free, expert-based reviews will be conducted to assess the system and improve it before the actual evaluation with end-users. Expert-based reviews and user testing are two methods that are beneficial to combine, as each one yields different results, therefore a greater number of issues is identified and the evaluation approach is more comprehensive [36]. To this end, three landmark prototypes of SHIFT technologies addressing end users will be assessed (see Figure 04): Prototype A, incorporating at least 50% of the functionality of the final system but not necessarily the same percentage of content; Prototype B, incorporating at least 75% of the final system content and functionality; and the Final Prototype, which will be the fully-featured and final in terms of content of the SHIFT system. Prototype A will be assessed by experts, with the aim of eliminating major usability and accessibility problems and providing guidance for forthcoming developments. Prototype B, being adequately mature in terms of functionality and content will be first assessed by experts and improved based on their comments, followed by a user-based assessment with a small number of users (5-10). The aim of this evaluation will be to identify any hindrances and misconstructions and utilize findings to improve the system and complete the development. Finally, the fully-fledged SHIFT prototype will be evaluated in large-scale pilot evaluations with end users, to assess its usability, accessibility, acceptance, and potential impact in delivering accessible high-quality experiences of CH.

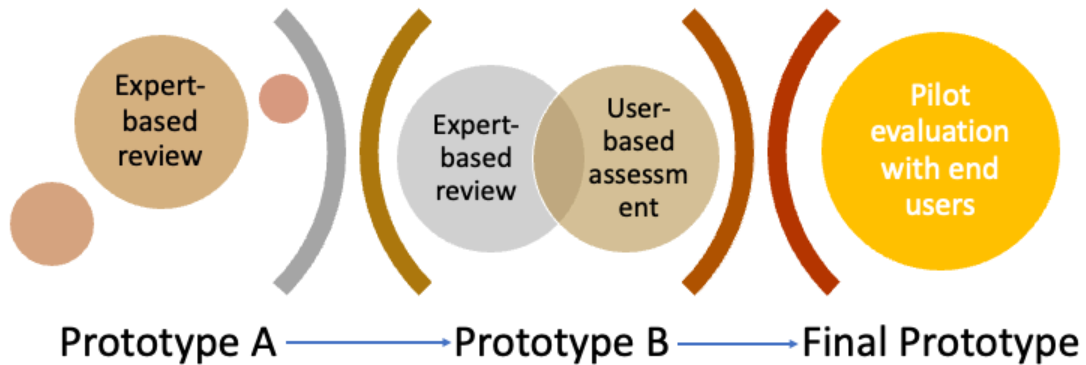**The SHIFT incremental development and evaluation process:**

Figure 16: SHIFT incremental development and evaluation process

Expert-based reviews are typically carried out by field experts, who adopting different methodologies, inspect the system with the aim to identify characteristics that may be troublesome to end users [37]. Expert-based reviews in SHIFT will combine cognitive walkthroughs [38], heuristic evaluation [37], and accessibility audits [39] to assess respectively the learnability, usability, and accessibility of the proposed solutions. To this end, experts who will participate include CH experts and curators, User Experience experts, and accessibility specialists.

User-based assessments, on the other hand, involve representative end users, who use the system, navigate the content and test out the functionality offered. With the aim to acquire both quantitative and qualitative results, various methods and instruments will be applied, depending on the prototype version assessed. More specifically, the following methodologies and techniques will be applied in the context of the user testing of Prototype B:

- Scenario-based assessment [40], where the users will use the system following a predefined scenario

- Think-aloud protocol ([41], asking users to vocalize their thoughts as they go through the system, aiming to get qualitative insights into system aspects that users find enjoyable or annoying

- User observation [42], targeted at identifying the system parts that may be troublesome to users

- Questionnaires ([43], for getting users' opinion on the usability of the system

- Interviews [44], aiming at elaborating further on system aspects that the users liked or disliked, as well as suggestions for improvements

The Final system prototype, as it will be deployed in large-scale pilots will employ the aforementioned procedure for a predefined number of end users. At the same time, the approach of free exploration and feedback through questionnaires will be adopted for the majority of visitors of the pilot sites, aiming to acquire long-term feedback stemming from non-orchestrated interactions with the system.

5.1.3 FORMAL REQUIREMENTS

This section collects formal requirements set by the EU grant agreement for the project and consequently also its evaluation measures. They are to be understood as the necessary absolute minimum, not a practical benchmark for satisfying results, and as such are included here only for the sake of completeness and to ensure that formal requirements are met. These target numbers and SHIFT Objectives (SOs) can be found in the Description of the Action (DoA part B) of the grant agreement.

- Project Objectives & key numbers

- SO1: "A minimum of 20 case reports to be analysed by the experts in the network for the identification of causes, response assessment and lessons learnt."

- SO2: ">100 users to be involved in the quality assessment of generated motion sequences throughout the duration of the project."

- SO3: ">50 citizens to evaluate 3D digital representation solutions from diverse communities."

- SO6: ">50 citizens from diverse background and abilities to evaluate the inclusion by design principles"

- SO7: "Participation in at least three (3) different standards organisations / At least five (5) input and output contributions to different standards organisations / SHIFT tools compliance to at least three (3) international accessibility standards"

- SO8: "> 3 demonstrations at co-located workshops and conferences"

While perhaps sufficient to ensure functionality and general agreeability of the tools, further means of obtaining more differentiated data need to be discussed.

5.2   ACCEPTANCE METRICS

After evaluations of the SHIFT tools have been conducted according to the three-tiered approach outlined above under section 5.1.2, a next step will be to devise appropriate metrics to gauge how well the tools are perceived to perform in the eyes of the users. As indicated, this may depend on and quite differ by the type of user: test users invited to trials and pilots; during normal operation between regular professional users working in CH and employing the tools to curate, transform, or provide content, and end-users actively employing the tools or passively enjoying their results provided by CH professionals; and lastly between users with disabilities, those with differing disabilities, and users without.

5.2.1 GENERAL CONSIDERATIONS

A number of different methodologies and tools are conceivable in order to gather user acceptance metrics data, to varying degrees of representativeness, specificity, detail, and invasiveness toward participants (as well as operative expenses to collect). The following discusses a list of options under consideration of such relevant criteria in order to provide guidelines for evaluation of the SHIFT tools, whether in designated pilot runs or (later on) during normal operation. Specific choices or combination of options may be necessary at the individual points of gathering data at the various SHIFT pilots, although it is the aim of this guideline to enable coordination of data collection and comparative analysis across the project. In ascending order of level of projected statistical value:

- **Logging** anonymous user/visitor numbers

- **Logging** anonymous user/visitor numbers, **distinguished** by type or admission (e.g. ticket rates of full price/children, student, elderly discounts/ reduced rates for disabled people and accompanying caretakers in countries where applicable)

- **Spot-checks with brief interview** with people observed testing or employing SHIFT tools or enjoying their results/products

- **Full opinionnaire/questionnaire/feedback form** handed out after visit, either on paper form, QR-code card, or mailed out; predictably yields richest data but might be considered invasive by visitors and privacy data rules apply

The criteria must be discussed and weighed against each other as well:

- **Representativeness** refers to the collected data in relation to the absolute number of visitors or users. If these numbers are for instance collected indiscriminately at the CH site register along with entrance fees, or by a server logging each request to one of the SHIFT tools, etc., the degree of representativeness can in theory be high to absolute. If only few users bother answering questionnaires, by contrast, representativeness will be low

- **Specificity** refers to the relatability of the data to one specific group of users, i.e. the blind. Indiscriminate logging will have no specificity at all but could be increased by differentiating between obvious markers attributable to users; for instance, reduced ticket prices if taken into account during logging, might indicate a percentage of eligible groups, but not necessarily their distribution or intersections (if groups such as elderly and the disabled share the same ticket category or individuals belong to multiple categories). Server logging of SHIFT tool usage, on the other hand could differentiate through the tool used and design target group

- **Detail** refers to the quality of acceptance data gained. While logging will garner user numbers, this will give no indication of whether individual exhibits related to SHIFT tools were visited, let alone how well the performance of the tool was judged. The same applies to server logging of use. By contrast, brief interviews can elicit specific details, while questionnaires yield data as detailed as the questions were designed to ask for as well as participants are willing to provide

- **Invasiveness** refers to the degree to which the collection of evaluation data can affect the user experience and is furthermore tied to data protection concerns. While simple logging may be of little concern on both counts, and in fact may not even be noticeable beyond the request for validation in the context of reduced fees, the more specific and detailed methods may be experienced by users as negative (be it from unwanted personal attention,

time expected to invest into answering questionnaires, or perceived intrusion into privacy). If a certain expectation can be assumed for voluntary participants in pilot test or professionals, the same does not have to be true for visitors during normal operation, who then may simply decline to engage with the evaluation, in turn diminishing the degree of representativeness

- **Operative expenses** or effort in turn refers not to users but to the labour going into conducting the survey. Logging should in principle cause minimal effort and can be automated, if this is not indeed data already gathered anyway in context of economic analysis, for example. Interviews by contrast require designated personal on site, and the conception and analysis of comprehensive questionnaires can consume significant resources

Table 6 incorporates methods as well as criteria into a chart to better visualise their correlation:

Table 6. Comparative chart of evaluation methods and criteria

Method	representative	specific	detail	invasiveness	Effort
Logging anonymous user/visitor numbers	high	low	none	none	minimal; automatic
Logging anonymous user/visitor numbers, distinguished	high	low	low	none to low	minimal; to differentiate
Spot-checks with brief interview	medium	high	medium to high	medium	medium; interviewer, analysis
Full feedback questionnaire	medium to low	high	high	high	high; conception, distribution, analysis

As a look over the chart indicates, there is no unequivocal gradient across the board and each of the methods have both benefits and drawbacks. Rather than settling for a compromise, a combination of quantitative and qualitative empirical methods should be employed to provide a flexible dataset from which acceptance

metrics can be extracted as well as comparatively juxtaposed between the same methods employed in different use cases.

Additional acceptance metrics that will be considered stem from the analysis of users' responses to questionnaires regarding the overall user experience provided and their satisfaction with the system as well as from performance metrics in user testing. In this respect, depending on the questionnaires that will be used additional benchmarks will be set for determining the acceptance of SHIFT technologies (e.g., at least 80% average user satisfaction with the system, 50% of users would recommend the system to a friend, at least 80% average successful accomplishment of tasks with the system, etc.). These benchmarks will be further elaborated as the project evolves and the evaluation methodology is further shaped and crystallized.

5.2.2 METHODOLOGIES

In terms of how the above considerations should on a technical level be translated and implemented into a methodology, a few definitions and concepts must be established. Taking a cue from prior user acceptance research, acceptance must be differentiated acceptability, and both terms are ultimately important due to the partially vulnerable group specific nature of some SHIFT tools. For instance, according to Shade and Schlag [45], acceptability can be defined as "prospective judgement". Potential users hypothetically consider whether to adopt an object, technology or service in positive or negative terms. By contrast, acceptance means the embracement of the object if made available in a practical setting, that is, real-world scenarios. This differentiation has been productively employed in a user acceptance model by Venkatesh et al. [46] which correlates acceptance with further criteria, namely perceived usefulness and perceived ease-of-use.

The complicating factor here is of course the issue of accessibility, or rather of disability in general. One the one hand, this has to do with the diverse group of people with disabilities and the even greater complexity of disability itself, distinguished between wildly differing categories of physical, sensory, and cognitive disabilities and their many subdivisions, which basically only have in common the fact that they impose barriers in one form or other on the affected person.

On the other hand remains the sad circumstance that despite all efforts and best intentions by everyone, accessibility rarely achieves complete elimination of

barriers and thus truly equal access, but in reality more often plays out as compensation, affirmative action, or on a personal level as a form of compromise (e.g., "am I willing to bind myself to the use of frequently expensive, cumbersome, stigmatizing, or sometimes even merely aesthetically displeasing assistive tools for variable but possibly only incremental improvement of life quality, or do I choose not to as long if I can get by without too much of a perceived loss as long as that is an option?").The converse perspective is the willingness of CH institutions, museums or sites, to invest more into accessibility than mandated by regulations. This means that the acceptability of a tool in general may greatly vary from the acceptance in each individual case. One more complicating issue unrelated or only indirectly connected to accessibility, but potentially related to inclusion is the perceived value or integrity of culture and art. Are different groups more likely or less to accept the transformation of culture, and perhaps more so for reasons of accessibility than to merely enhance the 'enjoyment' by younger generations more accustomed to multimedia technologies? One profound question to address and elicit answers is therefore: Are accessibility and inclusion weighed equal or differently?

These are questions that are difficult to ask or answer directly and without prejudice, because they carry implicit judgement. They therefore require a more subtle empirical instrument, which can map the factors acceptability, acceptance, usefulness, ease-of-use, and perceived value without drawing too much attention to itself. The minimum mode of engagement for qualitative assessment therefore should be interviews or questionnaires, and even those should be handled carefully. One method is to not be satisfied with single questions, but recurring questions within a given topic with variations that in turn focus on one particular criterion or aspect of the experience. These empirical tools for acceptance metrics will be carefully developed toward the next iteration as also the SHIFT tools move closer to readiness and contact with test users.

5.2.3 RECOMMENDATIONS

Despite the early and provisory state of the current iteration of the deliverable, this section will provide recommendations that should apply regardless of specific use cases to increase user responsiveness:

- Particularly in an evaluation about accessibility and inclusion, it must absolutely be not forgotten that the method of evaluation, i.e. interview or

questionnaire itself should be accessible and inclusive in content as well as process

- It should be possible to participate in the evaluation via different media and/or multimodal. Obviously, there are limits to this economically as well as technically, but it should be possible to obtain a questionnaire on CH location in paper form as well as access token (e.g. scannable QR-Code with link on handout calling card or fixed in place) to an online version

- Similarly, it should be possible to respond to a questionnaire immediately or at one's own leisure and place of comfort, either via mail-in or online version. (Note: this will presumably diminish return numbers)

- Not a contradiction to the above, but a necessary compromise decision: participants should be (gently) urged to fill out feedback immediately to improve return rates

In terms of content:

- Interviews or questionnaires should allow for differentiated answers, e.g. via a scale system (school grades, 5-point Likert scale, etc.) rather than binary yes/no answers

- A section of questions should be focused on and guided by the accessibility requirements relevant to the respective use case (cf. WCAG), but differentiate between personal (dis)satisfaction and principal acceptance, or add other additional qualifying questions

- (Optional) individual freehand feedback boxes should be included for further elaboration or comments

- etc. (further recommendations will be worked out as the exhibition cases become more concrete)

Here are three possible examples involving specific tools and use cases:

Example 1: "Video to Speech" tool and Accessibility Framework:

Did the audio description of [the content] give you a good mental image and impression of the object or scene?

-2 not at all / -1 negative / 0 neutral / +1 positive / +2 very well

If you are not visually impaired, would you judge the description as a loyal transformation for someone who is?

-2 not at all / -1 negative / 0 neutral / +1 positive / +2 very well

If you are not visually impaired but imagine you could not see [the content], would the transformation affect your experience positively or negatively?

-2 not at all / -1 negative / 0 neutral / +1 positive / +2 very well

If you are visually impaired, do you feel you have missed something others could see?

 -2 not at all / -1 negative / 0 neutral / +1 positive / +2 very well

Would you like to comment further?

……

Example 2: "Audio Narrative" and Accessibility Framework:

Did the audio narrative about [the content] catch your interest?

Please award school grades for your experience (1 = very good… 6 = not apt)

Did the voice and mode of narration appeal to you?

-2 not at all / -1 negative / 0 neutral / +1 positive / +2 very well

Was the content of the narration easy to follow and appropriate to your personal expectations?

-2 not at all / -1 negative / 0 neutral / +1 positive / +2 very well

If the narration were provided by a live tour guide instead, would you be satisfied and thank them?

        -2 not at all / -1 negative / 0 neutral / +1 positive / +2 very well

Would you like to further comment or criticize?

……

Example 3: "Image to Video" tool:

Did the animation added to the painting draw your attention?

Please award school grades for your experience (1 = very good,… 6 = not apt)

Did the animation enhance your experience?

-2 not at all / -1 negative / 0 neutral / +1 positive / +2 very well

Would you describe yourself as a purist and feel art should be left untouched "as is"?

-2 not at all / -1 negative / 0 neutral / +1 positive / +2 very well

Would you describe yourself interested in new technology and think art should benefit from it?

-2 not at all / -1 negative / 0 neutral / +1 positive / +2 very well

…

These are only examples but illustrate that subtle variations in questions will elicit a different focus in regard to the acceptance criteria if the object of the feedback is specific enough.

5.3   DISCUSSION

Overall, motivated by the commitment of SHIFT to accessibility and its focus on meeting the needs and expectations of its users, this section has reviewed general considerations for accessibility and acceptability of the developed technologies by end-users and has laid out the methodologies that will be adopted for the assessment of the project's outcomes. In a nutshell, assessment will be driven by a combination of expert-based audits and in situ user testing, ensuring an efficient and effective approach for the iterative improvement of the developed technologies until their final assessment by representative end users.

As the eventual acceptance of a technology is determined in principal by two core attributes, namely its usefulness and ease of use, SHIFT shall carefully pay attention to the requirements that have been elicited through desk research, best practice analysis, and responses to user questionnaires, and will capitalize on the expertise of the consortium partners toward achieving these goals. The final assessment of its adherence to the accessibility standards and the requirements

of end users will be conducted through user testing in the context of the project's pilot activities. In this regard, well-established user testing methodologies will be employed, as they have been designated in the current deliverable section. The final evaluation methodology will be described in detail in the updated version of the current deliverable, D1.4 'SHIFT requirements, user evaluation guidelines and acceptance metrics – final version', due in M21.

6.   USER REQUIREMENTS

The following section aggregates the user requirements identified for the SHIFT tools in particular, and to a degree also for modernised cultural heritage in general. Due to the early stage in the project and the consequently still limited data collection, it must be stressed that the identified user requirements need to be considered preliminary and might considerably shift over the course of the next months. The reason for this is the heterogeneity of multiple aspects of the project: The target user groups includes CH professionals as well as end-users who visit CH institutions; i.e. producers as well as consumers of cultural content. In fact, this differentiation still does not produce homogenous categories, but considering the project's emphasis on accessibility can differentiate further into people with disabilities and those without, a personal category that then intersects with the professional status as either CH worker or end-user. Moreover, each category can and should be distinguished further to avoid getting too broad requirements. In other words, the ambition should not be to find the lowest common denominator but to identify specific needs and devise solution that effectively help to include vulnerable groups who statistically often play only a minor role. This entails a differentiation between categories of disabilities (physical, sensory, cognitive) or even between sub-categories (e.g. sensory impairment differentiates the blind, the visually impaired, the hearing impaired, etc.), all of which can have entirely unique requirements. Contrary to the mantra of mainstreamed design, one size does not fit all. To a lesser degree, this also applies to the professional categories, because CH professionals can include diverse tasks performed by curators, librarians, archivists, researchers etc., who may have significantly different expectations from each other. This situation is further complicated by the SHIFT tools themselves and which aspects they address. On the one hand, the latter can apply to either the type of content they are designed to process, enhance or augment, or apply to accessibility which they will facilitate. On the other hand, since the SHIFT tools are conceived as a loosely decoupled set of tools to address these various issues, the tools themselves must be diverse.

Consequently, the data collection and user requirements results must reflect this heterogeneity. This requires taking account of and analysis of different perspectives, as well as extensive empirical research to then validate them – or vice versa. Since at this early stage it is impossible to collect data from the different groups in equal manner, either because of how to reach out for data or because there is not yet any tangible product that can be presented to end-users, the following collected data stems from different but complementary methodologies. The stakeholder user requirements stem from empirical data via a questionnaire, se section 4 above; the accessibility perspectives of persons with disabilities stem from the Persona approach [47], that is an emphatic UX design approach gaining insight through hypothetical role-playing, which in this case is substantiated by

expert opinion offered by the project partner and directly affected representative of vulnerable groups. Therefore, the data has been processed with awareness of potential shortcomings in the data due to this two-fold approach of methodologies as well as of practical shortcomings within individual methods[15] exacerbated by the limited volume of preliminary data. Nevertheless, even the preliminary data can already offer valuable projections that will have to be validated in the following months by increased and more representative empirical data collection and cross-validation of results via complementary methods such as the Persona model or expert opinion.

The following therefore lists preliminary insights which will be compounded into a temporary data table to cross-check for overlapping or diverging unique user requirements. The stakeholder user requirements will not be listed again and only incorporated into the table, as they can be found in the questionnaire analysis.

User requirements of Personae with disabilities:

Visually impaired (not blind):
- Beforehand information on accessibility at CH institution should also take into account sensory impairment, not only physical barriers (e.g. indicate available technology like variable lighting, inductive loops for hearing aids, FM systems, etc.). Ideally, the information should give indications about supported or prohibited improvised (assistive) tools like flashlights, cameras (if used as digital looking glasses), "glassholes", but also non-technical tools such as guide dogs)
- Navigation inside the exhibition should be clear. Possible solutions include: maps/terminals (print / digital); guiding systems; installed buttons to call for assistance
- It should be possible to ask for assistance. Possible solutions include: personnel available to ask, call button to ask for assistance, A.I. assistants
- Exhibits should be easily discernible with less than 20/200 vision. Possible solutions include: adjustable lighting, contrast schemes, possibilities to get close to exhibits, supplemental close-ups via photos/images
- Signage and (descriptive) text should be legible with less than 20/20 vision. Possible solutions include: position of text easy to get close to, good contrast, large/variable font size (via digital screen)
- Availability of content to access digitally (on personal or institution-owned device)

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[15] That is, we are aware of the unbalanced dataset of mostly stakeholders versus few end-users, as well as aware of the recently contested value of empathic design [cf. 48], which was counteracted by drawing on insider knowledge.

- Multimodality of engagement or alternative formats. Possible solutions include: audio description/narrative available (via tour guide, digitally recorded or live), tactile representations

Blind:
- Beforehand information on accessibility at CH institution should also take into account sensory impairment, not only physical barriers (e.g. indicate available technology like variable lighting, inductive loops for hearing aids, FM systems, etc.). Ideally, the information should give indications about supported or prohibited improvised (assistive) tools like flashlights, cameras (if used as digital looking glasses), "glassholes", but also non-technical tools such as guide dogs)
- Navigation inside the exhibition should be clear. Possible solutions include: maps/terminals (print / digital); guiding systems; installed buttons to call for assistance
- It should be possible to ask for assistance. Possible solutions include: personnel available to ask, call button to ask for assistance, A.I. assistants
- Availability of content to access digitally (on personal or institution-owned device)
- Multimodality of engagement or alternative formats. Possible solutions include: audio description/narrative available (via tour guide, digitally recorded or live), tactile representations

Hearing-impaired:
- Beforehand information on accessibility at CH institution should also take into account sensory impairment, not only physical barriers (e.g. indicate available technology like variable lighting, inductive loops for hearing aids, FM systems, etc.). Ideally, the information should give indications about supported or prohibited improvised (assistive) tools like flashlights, cameras (if used as digital looking glasses), "glassholes", but also non-technical tools such as guide dogs)
- Navigation inside the exhibition should be clear. Possible solutions include: maps/terminals (print / digital); guiding systems; installed buttons to call for assistance
- The environment should reduce disrupting effects such as noisy situations or bad acoustics. Possible solutions include: inductive loops for heating aids, FM systems, ANC headphones, quiet rooms to rest
- Availability of content to access digitally (on personal or institution-owned device)
- Multimodality of engagement or alternative formats. Possible solutions include: audio description/narrative available (via tour guide, digitally recorded or live), tactile representations

The following table juxtaposes the user requirements gained from the stakeholder questionnaire with those derived from the Persona based approach for end-users with accessibility needs. Due to the differing methodologies which have not yet been cross-validated within a unified framework (i.e. a shared set of terminology and questionnaire options), the representation is approximate. The technique used is a manual alignment of similar or close requirements.

Table 7: Preliminary user requirements aggregation

Functionalities:	CH professional feedback	End-user feedback (visually impaired)	End-user feedback (blind)	End-user feedback (hearing impaired)
Visual contrast: For good visual perception, adjacent surfaces should differ not only in colour, but also in shade. For people with partial or total colour blindness, this light/dark contrast is extremely important.		y		
Visual contrast: Matching or similar colours, such as light blue and dark blue or light green and dark green, should therefore be avoided.		y		
Visual contrast: The colour combination red/green is completely unsuitable (approx. 9% of the population suffer from a red-green colour blindness).		y		
Picture to animation transformation	y			
Text to Speech transformation.	y	Y	y	
Image and video processing by enhancing contrast of the visual content.	y			
User-friendly access to various approaches and perspectives regarding CH artifacts, with the possibility of sorting, filtering, labeling, classification is the most important benefit of a technology-assisted system for curating efficiency.	y		y	y

Facilitating access to various digitized CH resources (publications, studies, collections, catalogs, exhibitions, virtual tours, audio-video materials, etc.	y	y	y	y
Multimedia content: images, videos, podcasts and other multimedia formats, which the IT system can sort, metadata and classify according to the topics relevant to the end users' preferences.	y		y	y
Virtual Guides: An artificial intelligence assistant could be programmed to provide information about exhibits and events , as well as answer user questions.	y	y	y	y
Digital representation of objects to watch on visitor's devices (like tablets): to magnify images, to highlight details, to strengthen contrasts, to delete details; this could help partially sighted persons or persons with motoric problems.	y	y		y
An automatic guide system that composes special tours in the collection of objects related to children, gender equality, ethnic aspects, disabilities, etc.	y	y	y	
Accessibility: possibility of access to cultural heritage information in a variety of formats, including text, image and media, through an intuitive and personalized interface. AI-assisted computer systems could provide accessibility through advanced search tools and recommendation algorithms.	y	y	y	y
Interface accessibility: the system can be used easily by all users as a priority, including disabled people	y	y	y	y

Using a clear and intuitive navigation menu adapted to the visually impaired.	y	y	y	
Using an appropriate font to facilitate reading for people with low vision.	y	y		
Suitability of the CH content to the cultural diversity of the users	y			
Information and components of the IT system should be delivered to users in ways that they can receive and understand correctly regardless of any disabilities or physical limitations they may encounter.	y	y	y	y
Stories that present oral or traditional histories collected from local communities.	y			y
Stories like virtual tours that provide information about the cultural heritage of an area, heritage building, museums, libraries, archives, etc.	y	y	y	y
Stories representing descriptions of tangible (photographs, works of art, monuments, etc.) and intangible (landscapes, attributes /approaches/songs, etc.) CH items.	y	y	y	
Stories that increase the emotional impact of CH digital content by integrating musical compositions or suggestive images.	y			

Even at this early stage, comparison between the professional users and the users with accessibility requirements shows overlap as well as divergent interests, which necessitate careful distinction. Even then, the Persona-based user requirement profiles show considerable overlap in its principal points of interest, yet also reveals divergence in the details and in how accessibility in fact can be realised. Despite their closeness in terms of sensory-related impairments, there are significant differences in their needs between them. Speaking from anecdotal experience, it can only be expected that these differences will result in differing perceived usefulness of solutions, if for instance an alternative format is less helpful than

improving the original format for certain groups (Just for example, a tactile transformation of a visual object might be significantly less helpful for someone visually impaired than for someone blind, if the former is not trained to recognise by touch. For this specific impairment type, visual enhancement or transformation into audio description might be preferable. Conversely, only audio description might deprive someone blind of the direct and more personal perception of touch). The above also completely neglects the other forms of disability, physical and cognitive, which along with sensory impairments will have to be studied more closely and in-depth with empirical data until the next months and course of the project to refine the findings.

7. CONCLUSION

In its current iteration as D1.1, this report provided preliminary evidence and empirical data showing that there is both a need for and interest in digital tools in the cultural heritage sector.

The rapid technological progress over the last few decades has led to interesting developments in an increasingly complex world. One is a noticeable shift from the importance of hardware to that of software, which theoretically can function across a multiplicity, but then must also be consistently accessible across the board. The SHIFT tools have an advantage here, insofar as they are designed right from the beginning with multimodality and accessibility in mind – the exception being the haptics toolkit which requires hardware currently considered specialised. The rate of technological development also has an impact on its regulation. Standards governing technology, an increasing awareness of and regulation of accessibility needs, and the combination of the two areas are challenges faced by both legislative bodies and self-government within the industry. In light of an essentially cooperative relationship between the two bodies, but the different speeds with which they can keep up with the rate of development, it has been decided to use the legal framework as baseline (as indeed is legally required) but incorporate the independent industry group standards closer to the cutting edge of technology – provided they operate in the spirit of open access(ibility).

Concerning stakeholder user requirements, the two-fold methodology of best practice cases augmented by empirical studies shows that at the current state there is much room for progress and improvement. Despite the initially high number of respondents satisfied with existing technology (84,8% relatively satisfied or better), this is contrasted by the positive response to the many best practice examples as well as questionnaire answers to more specific questions about particular solutions and tools. It may also be assumed to be currently biased by the sample size and method of distribution of the survey prototype. Of course, this will change once the survey goes from preliminary to full-scale.

User evaluation taking into account CH professionals as well as general public users will follow a three-tiered approach at different stages in the development of the tools, ranging from functional testing with experienced testes with early prototypes to controlled pilot testing with groups of end users to ensure that quality and accessibility standards such as the WCAG are met. For acceptance, meanwhile, metrics will be developed that account for the complexities stemming from the diversity of disability and the complementary value systems of accessibility,

inclusion, and culture/art. Awareness of the importance of inclusion in CH institutions is significantly increasing. Functioning in ever more complex societies CH have generally incorporated into their mission, values and methods of working that they are inclusive institutions and that their collections exist for all visitors, regardless of their (dis)ability and identity. Also, most CH institutions have developed strategic partnerships with end-users (associations of persons with disabilities) on a long-term basis, which enables constant dialogue and feedback on CH institutions' plans and their realization. These developments within the CH sector are a qualitative leap towards developing the demand side for the development of assistive technologies.

The next iteration of this report, deliverable D1.4 due in M21 will flesh out the approaches and methodologies delineated above by data gained from the project itself as well as more research into the areas introduced here. Prospective areas to deepen the research include a broader and more international best practice selection, larger and more representative empirical research, consideration, and monitoring of the development of the European Accessibility Act in its adoption into national laws and the corresponding transition periods and practical impact on the industry and market. And of course, continued effort must be put into the refinement of user evaluation and acceptance metrics frameworks, which at this stage can only be anticipated but undoubtedly will become clearer as the SHIFT project develops. There is a significant potential to use the data and lessons learned from the SHIFT project, mainly through the collaborations between public, private and civil sectors of consortium partners, to provide feedback within the European policy framework concerning accessibility, inclusion and development of digital technologies.

LIST OF REFERENCES

[1] Kljun, M., Čopič Pucihar, K., and Coulton, P. (2018). 'User Engagement Continuum: Art Engagement and Exploration with Augmented Reality', in V. Geroimenko (ed.) *Augmented Reality Art. Springer Series on Cultural Computing*. . Link: https://doi.org/10.1007/978-3-319-69932-5_18

Kotsopoulos, K.I., Chourdaki, P., Tsolis, D. et al. (2019). *An authoring platform for developing smart apps which elevate cultural heritage experiences: A system dynamics approach in gamification*, Journal of Ambient Intelligence and Humanized Computing, 10. Link: https://doi.org/10.1007/s12652-019-01505-w

[2] Stephanidis, C. (Ed.). (2009). *The universal access handbook*. Boca Raton: CRC Press.

[3] UNESCO (2015). *The New Delhi Declaration on Inclusive ICTs for Persons with Disabilities: Making Empowerment a Reality*. Link: https://unesdoc.unesco.org/ark:/48223/pf0000232026

[4] Longo, D., et. al. (2020). '*Cultural Heritage and Interoperable Open Platforms: Strategies for Knowledge, Accessibility, Enhancement and Networking'*. S. Syngelinakis and S. Hernandez (eds.) *Sustainable Development and Planning XI: Vol. 241 of WIT Transactions on Ecology and the Environment*. Southhampton: WIT, pp. 371-382.

[5] Coates, C. (2019). '*Best practice in making Museums more accessible to visually impaired visitors'*. *MuseumNext*. Linkt: https://www.museumnext.com/article/making-museums-accessible-to-visually-impaired-visitors/

[6] Ellis, K. (2017). '*#socialconversations: disability representation and audio description on Marvel's Daredevil',* in K. Ellis and M. Kent (eds.) *Disability and Social Media Global Perspectives*. Routledge.

[7] EPRS (2018). *Assistive technologies for people with disabilities. Part II, Current and emerging technologies*. Link: https://op.europa.eu/en/publication-detail/-/publication/d657a81b-184c-11e8-ac73-01aa75ed71a1/language-en

[8] '*How can your museum better welcome families and young people who are blind or partially sighted?'*. *Kids in Museums*. Link: https://kidsinmuseums.org.uk/resources/how-can-your-museum-better-welcome-families-and-young-people-who-are-blind-or-partially-sighted/

[9] Project summary in Horizon Europe Grant Agreement 101060660.

[10] United Nations Human Rights Office of the High Commissioner (2023). *Status of Ratification Interactive Dashboard*. Link: https://indicators.ohchr.org/

[11] United Nations General Assembly (2006). *United Nations Convention on the Rights of Persons with Disabilities*. Link: https://www.un.org/disabilities/documents/convention/convention_accessible_pdf.pdf

[12] Schulz, M., and Lesay, I. / European Parliament, Council of the European Union (2016). *Directive (EU) 2016/2102 of the European Parliament and of the Council of 26 October 2016 on the accessibility of the websites and mobile applications of public sector bodies.* Link: https://eur-lex.europa.eu/eli/dir/2016/2102/oj

[13] European Commission (2023). 'Web Accessibility Directive — Standards and harmonisation'. *Shaping Europe's digital future*. Link: https://digital-strategy.ec.europa.eu/en/policies/web-accessibility-directive-standards-and-harmonisation

[14] ETSI (2021). *EN 301 549 V3.2.1 - Accessibility requirements for ICT products and services*. Link: https://www.etsi.org/deliver/etsi_en/301500_301599/301549/03.02.01_60/en_301549v030201p.pdf

[15] European Parliament, Council of the European Union (2019). *Directive (EU) 2019/882 of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services*.Link: http://data.europa.eu/eli/dir/2019/882/oj

[16] European Parliament, Council of the European Union (2015). *Annex to the Proposal for a Directive of the European Parliament and of the Council on the approximation of the laws, regulations and administrative provisions of the Member States as regards the accessibility requirements for products and service*. Link: https://ec.europa.eu/social/BlobServlet?docId=15017&langId=en

[17] ISO/TMBG (2014). *ISO/IEC Guide 71:2014(en). Guide for addressing accessibility in standards*. 2nd edition. Link: https://www.iso.org/obp/ui/#!iso:std:57385:en

[18] ISO/TC 159 (2021). *ISO/TR 22411:2021. Ergonomics data for use in the application of ISO/IEC Guide 71:2014*. 2nd edition. Link: https://www.iso.org/standard/78847.html

[19] Lawton Henry, S. (ed.) (2023). 'WCAG 2 Overview'. *W3C/WAI: Strategies, standards, resources to make the Web accessible to people with disabilities*. Link: https://www.w3.org/WAI/standards-guidelines/wcag/

[020] Lawton Henry, S., and Brewer, J. (eds.) (2022). 'WCAG2ICT Overview'. *W3C/WAI: Strategies, standards, resources to make the Web accessible to people with disabilities*. Link: https://www.w3.org/WAI/standards-guidelines/wcag/non-web-ict/

[21] O'Connor, J., et al. (eds.) (2021). *W3C XR Accessibility User Requirements*. Link: https://www.w3.org/TR/xaur/

[22] XR Association (2020). 'Chapter Three: Accessibility and Inclusive design in immersive experiences', in X*R Association Developers Guide: An industry-wide collaboration for better XR*. Link: https://xra.org/wp-content/uploads/2020/10/XRA_Developers-Guide_Chapter-3_Web_v3.pdf

[23] Kim, D., et al. (2023). *Microsoft Inclusive Design – Cognitive Exclusion*. Link: https://inclusive.microsoft.design/tools-and-activities/InclusiveDesignForCognitionGuidebook.pdf

[24] Allmanritter, V. (2019). *Nichtbesucher*innen als Themenfeld für Kultureinrichtungen.* Zukunftsakademie NRW, Bochum.

[25] European Commission, Directorate-General for Education, Youth, Sport and Culture. (2017). *Special Eurobarometer 466: Cultural Heritage*, octobre 2017, p. 51.

[26] European Commission, Directorate-General for Education, Youth, Sport and Culture. (2017). *Special Eurobarometer 466: Cultural Heritage*, octobre 2017, p. 53.

[27] Allmanritter, V., & Tewes-Schünzel, O. (2023). *kurz&knapp-Bericht Nr. 5 "Kultureinrichtungen in (post-pandemischem) Veränderungsdruck – wie zu anderer Relevanz gelangen?"* aus der Bevölkerungsbefragung Kulturelle Teilhabe in Berlin 2023, Institut für Kulturelle Teilhabeforschung | IKTf, Berlin.

[28] Johannes Gutenberg-Universität Mainz. (2021). *KULTURELLE BILDUNG UND KULTURPARTIZIPATION IN DEUTSCHLAND*. Link: https://kulturpartizipation.uni-mainz.de/ergebnisse-partizipation-im-trend/https://kulturpartizipation.uni-mainz.de/ergebnisse-partizipation-im-trend/[29] Schoder, A. (2022). Auf den Spuren der Museums-Nichtbesucher. musermeku Kunst & Kultur News. Link: https://musermeku.org/museums-nichtbesucher/

[30] European Commission, Directorate-General for Education, Youth, Sport and Culture. (2017). *Special Eurobarometer 466: Cultural Heritage*, octobre 2017, p. 60.

[31] Borsenberger, M., & Lorentz, N. (2022). *Le public des musées - Eléments de synthèse de l'enquête sur les pratiques muséales 2020.* Les études du ministère de la Culture 01, Luxembourg, p. 12 f.

[32] Kirkpatrick, A., et al. (eds.) (2018). *Web Content Accessibility Guidelines (WCAG) 2.1*. Link: https://www.w3.org/TR/WCAG21/

[33] O'Connor, J., et al. (eds.) (2021). *W3C XR Accessibility User Requirements*. Link: https://www.w3.org/TR/xaur/

[34] XR Association (2020). 'Chapter Three: Accessibility and Inclusive design in immersive experiences', in X*R Association Developers Guide: An industry-wide collaboration for better XR*. Link: https://xra.org/wp-content/uploads/2020/10/xra_dev_guide_chapter3.pdf

[35] ISO/TC 159 (2019). ISO 9241-2*10:2019. Ergonomics of human-system interaction — Part 210: Human-centered design for interactive systems*. 2nd edition. Link: https://www.iso.org/standard/77520.html

[36] Paz, F. and Pow-Sang, J. A. (2014). *'Current trends in usability evaluation methods: a systematic review',* in Proceedins: 2014 7th International Conference on Advanced Software Engineering and Its Applications. Los Angeles: IEEE, pp. 11-15.

[37] Nielsen, J. (1994). *'Heuristic Evaluation',* in J. Nielsen & R. L. Mack (eds.) *Usability inspection methods*. New York: John Wiley & Sons, pp. 25-62.

[38] Mahatody, T., Sagar, M., and Kolski, C. (2010). 'State of the art on the cognitive walkthrough method, its variants and evolutions', *Intl. Journal of Human–Computer Interaction*, *26*(8), pp. 741-785.

[39] Calvo, R., Seyedarabi, F., and Savva, A. (2016). 'Beyond web content accessibility guidelines: expert accessibility reviews', in *Proceedings of the 7th international conference on software development and technologies for enhancing accessibility and fighting info-exclusion*. New Yor: Association for Computing Machinery, pp. 77-84.

[40] Nielsen, J. (1993). *Usability Engineering*. San Francisco: Morgan Kaufmann. Lewis, J. R. (2001). 'Introduction: Current issues in usability evaluation', *International Journal of Human-Computer Interaction*, *13*(4), pp. 343-349.

[41] Boren, T. and Ramey, J. (2000). 'Thinking aloud: Reconciling theory and practice', *IEEE transactions on professional communication*, *43*(3), pp. 261-278.

[42] Nielsen, J. (1993). *Usability Engineering*. San Francisco: Morgan Kaufmann.

[43] Lewis, J. R. (2014). 'Usability: lessons learned… and yet to be learned', *International Journal of Human-Computer Interaction*, *30*(9), pp. 663-684.

[44] Portigal, S. (2013). *Interviewing users: how to uncover compelling insights*. New York: Rosenfeld Media.

[45] Schade, J., and Schlag, B. (2003). 'Acceptability of urban transport pricing strategies', T*ransportation Research Part F: Traffic Psychology and Behaviour*, 6(1), pp. 45-61.

[46] Venkatesh, Viswanath; Bala, Hillol (2008). 'Technology Acceptance Model 3 and a Research Agenda on Interventions', in *Decision Sciences,* 39 (2), pp. 273–315. Available at: DOI: 10.1111/j.1540-5915.2008.00192.x

[47] Friis Dam, R., and Siang, T.Y. (2022). 'Personas – A Simple Introduction'. *Interaction Design Foundation. Link*: https://www.interaction-design.org/literature/article/personas-why-and-how-you-should-use-them

[48] Kasiske, F. (2020). 'UX-Design: Warum das Persona-Konzept nicht zielführend ist'. t3n digital pioneers. Link: https://t3n.de/news/ux-design-persona-konzept-1246642/

ANNEX – REVISION CHANGEs LOG

Minor streamlining of terminology throughout

Inserted sub-chapter 4.1; clarification of stakeholders

Moved previous chapter 4. on 'Stakeholder User Requirements' to sub-chapter 4.2, rebranded as focus on specific stakeholders: CH experts

New sub-chapter 4.3 on specific stakeholders: general public; including sub-chapters on 'non-visitors' and methodologies

New sub-chapter 4.4 on upcoming research actions

List of Tables and Figures updated

The Members of the SHIFT Consortium:

Organizations	Country	Role
SIMAVI - SOFTWARE IMAGINATION & VISION	Romania	Coordinator
FORTH - IDRYMA TECHNOLOGIAS KAI EREVNAS	Greece	Partner
MDS - MASSIVE DYNAMIC SWEDEN AB	Sweden	Partner
AUD - audEERING GmbH	Germany	Partner
UAU - UNIVERSITAET AUGSBURG	Germany	Partner
SOMKL - MAGYAR NEMZETI MÚZEUM – SEMMELWEIS ORVOSTÖRTÉNETI MÚZEUM	Hungary	Partner
ANBPR - THE NATIONAL ASSOCIATION OF LIBRARIANS AND PUBLIC LIBRARIES IN ROMANIA	Romania	Partner
SPK - STIFTUNG PREUSSISCHER KULTURBESITZ	Germany	Partner
BMN - THE BALKAN MUSEUM NETWORK	Bosnia and Herzegovina	Partner
HERITAGE - HERITAGE MANAGEMENT	Greece	Partner
ERC - ETICAS RESEARCH AND CONSULTING	Spain	Partner
DBSV - GERMAN FEDERATION OF THE BLIND AND PARTIALLY SIGHTED	Germany	Partner
QMUL - QUEEN MARY UNIVERSITY OF LONDON	United Kingdom	Associated Partner

Contact:

Project Coordinator: **Purcarea Razvan** **SIMAVI**- SOFTWARE IMAGINATION & VISION	razvan.purcarea@simavi.ro

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