

MUSEUM ACCESSIBILITY AND PEOPLE WITH DISABILITIES: THE CHALLENGE OF CO-DESIGNING PATHWAYS

ACCESSIBILITÀ MUSEALE E PERSONE CON DISABILITÀ: LA SFIDA DELLA CO-PROGETTAZIONE DEI PERCORSI

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ABSTRACT

As the UN Convention on the Rights of People with Disabilities (2006) states, participation in cultural life, recreation, leisure and sport is a full right connected to the level of inclusiveness that people with disabilities can experience. Accordingly, scientific literature upholds how access to culture and social life can foster the Quality of Life of all people. With the direct involvement of people with disability through a participatory methodology, our research group co-designed, developed and tested innovative digital solutions incorporating multisensory technologies and accessible storytelling to create an inclusive museum experience. The findings of this study provide valuable insights for the development of inclusive design solutions in museum contexts, promoting technology integration to ensure equal opportunities of participation in social and cultural life.

La Convenzione delle Nazioni Unite sui diritti delle persone con disabilità (2006) sancisce il diritto alla partecipazione alla vita culturale, al tempo libero e allo sport, il quale è strettamente legato al livello di inclusività che le persone con disabilità possono sperimentare. La ricerca scientifica conferma che l'accesso alla cultura e alla vita sociale può migliorare la qualità della vita per tutti. Il nostro gruppo di ricerca ha collaborato direttamente con persone con disabilità nella progettazione, sviluppo e sperimentazione di soluzioni digitali innovative per creare un'esperienza museale inclusiva, integrando tecnologie multisensoriali e una narrazione accessibile. Questo studio fornisce indicazioni per lo sviluppo di soluzioni progettuali inclusive nei contesti museali, promuovendo l'utilizzo delle tecnologie per garantire pari opportunità di partecipazione alla vita sociale e culturale.

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Introduction

Contemporary societies are facing new challenges emerging from the generative relationship between territories and institutions concerning the dissemination of information and useful skills for social, disseminating scientific knowledge, and increasing civic awareness (Giaconi *et al.*, *in press*). Concerning academic contexts, new research paths unfold as part of the Third Mission, which involves creating virtuous and sustainable learning ecosystems characterised by digital and cultural innovation. In this framework, activating valuable processes requires an approach that matures along horizontal trajectories connecting local communities and university areas to fully exploit collaborative networks and alliances' epistemological and generative validity (Giaconi *et al.*, 2023). Through work moving from theory to practice, in collaboration with key stakeholders, opportunities for active understanding and involvement can be created, leading to the practical application of research results in the territory. The direct responsibility for social change (Varriale *et al.*, 2022; Del Gottardo, Rossiello, 2022) therefore encourages university contexts to play a central role in promoting an inclusive culture, both inside and outside its institution (Varriale *et al.*, 2022). This process allows universities to provide tools and practices, transferring knowledge and enhancing the necessary subject competencies. In this line, the dialogue between universities and the third sector arises naturally alongside the possibility of research oriented towards innovation and the transformation of cultural heritage from an accessibility perspective. This requirement, in harmony with the guarantee and protection of the rights of persons with disabilities to access cultural heritage (UN, 2006), allows us to reflect both in terms of physical accessibility (UN, 2006, Article 9a) and terms of accessibility to cultural content and experiences (UN, 2006, Article 9b). These premises recall how the pedagogical value of culture and education in cultural heritage is functional to social participation and, therefore, to the achievement of significant levels of Quality of Life in persons with disabilities (Giaconi, 2015). Building on these considerations, this contribution will illustrate the redesign process of a museum experience conducted by the research group in Special Pedagogy of the University of Macerata to implement accessibility and cultural inclusion (Mace, 1985; UN, 2006; Schalock, Verdugo Alonso, 2006; ISTAT, 2019; Giaconi *et al.*, 2021).

1. Museum accessibility: a pedagogical reading

The concept of accessibility, in line with the studies of Special Pedagogy (Gimenez, Thomas, 2015; Greek, 2019; Caldarelli, 2023; Giaconi *et al.*, 2023) and as also specified by the UN Convention on the Rights of Persons with Disabilities (UN, 2006), goes far beyond the removal of physical barriers (Art. 9a), calling into question also forms of accessibility to cultural content and experiences (Art. 9b). These considerations encourage cultural institutions to reflect on the usability of content and information, ensuring a true involvement in visiting experiences and real opportunities for exploration, participation and learning (Giaconi *et al.*, 2023).

Presenting a brief reconnaissance of the guidelines concerning accessibility in places of culture (Rappolt-Schlichtmann, Daley, 2013; Cho, Jolley, 2016; Seale *et al.*, 2021; Leahy, Ferri, 2022), including museums, it emerges that more attention is being paid to the issue of physical accessibility.

On an international level, we can mention, by way of example, the provisions from the International Council of Museums, the leading non-governmental organisation of museums and their professionals. Over the years, it has issued guidelines (ICOM Accessibility Guidelines) and manuals (ICOM Training Manual: Museums and Accessibility) containing operational guidance and suggestions for museum staff training on accessibility and inclusion.

On the European level, the *Recommendation of the Committee of Ministers to member States on the European Cultural Heritage Strategy for the 21st century of 2017* (Council of Europe, 2017) is one of the main guiding documents for cultural heritage policies¹, in which multiple implementation strategies are highlighted, among which we can observe: activities to increase the participation of visitors with physical and sensory disabilities; the design of new paths and ways of presenting content; etc. This plurality of provisions is aimed at responding to the diverse needs of the visiting public, taking into account the plural modes of interacting with and discovering the cultural heritage exhibited.

Italy's most recent and important provisions are the Guidelines for Drafting the Plan for Eliminating Architectural Barriers in Museums, Museum Complexes, Archaeological Areas, and Parks (P.E.B.A) (2018). Again, the main objective is to promote accessible and inclusive cultural places by identifying operational lines to

¹ <https://rm.coe.int/16806f6a03>

make cultural resources accessible to a wider audience of visitors, regardless of operating profiles.

Entering into the merits of pedagogical considerations about accessibility, in line with the principles of *Universal Design for Learning* (UDL) (Rappolt-Schlichtmann, Daley, 2013; Savia, 2016), our design focus is directed towards the promotion of flexible solutions able to respond to the complex interaction that is created between the visitor and the museum context (WHO, 2001). In this direction, the use of new technologies, such as Apps, Head Mounted Displays (HMDs), 4D sound environments, haptic devices, etc., can offer *media* for the design of accessible museum content (Luigini, Panciroli, 2021; Giaconi *et al.*, 2021; Caldarelli, 2023; Giaconi *et al.*, 2023).

A museum space that meets accessibility criteria, for instance, concerning people with visual sensory disabilities, can provide plural communication and representation channels, such as the enjoyment of cultural content through haptic exploration (Fusinetti, Empler, 2019) or audio description listening (Fiorucci, Pinnelli, 2013; Del Bianco *et al.*, 2019; Pacinotti, 2019; Perego, 2019). Alongside different perceptions and understandings of information, how people navigate and actively interact with the museum environment may also differ (Rappolt-Schlichtmann, Daley, 2013). We can think of those with difficulties in movement, communication, orientation, or spatial organisation. For these reasons, in previous research (Giaconi *et al.*, 2020; Giaconi *et al.*, 2021), we have highlighted how, regarding the functioning profile of people with Autistic Spectrum Disorder who have difficulty creating *forward models* (Barale *et al.*, 2009), *Virtual Reality* and *Augmented Reality* options can respond to their need for anticipation with respect to space exploration. Finally, another element to be considered is the public's engagement, which may vary depending on visitors' background of knowledge, culture, interest, etc., (Rappolt-Schlichtmann, Daley, 2013). Additionally, in this direction, it is important to provide different options, paths and activities that can help increase the visitor's active participation (Del Bianco *et al.*, 2019). Different possibilities of interaction with the museum environment and activities for a customisable *engagement* can be provided, together with supports and strategies (also technology-based) able to respond to specific personalisation needs (Giaconi *et al.*, 2023). To this end, using Virtual and/or Augmented Reality solutions or Artificial Intelligence can contribute to creating interactive and immersive museum environments capable of enhancing audience *engagement* (Luigini, Panciroli, 2021; Rossi *et al.*, 2024).

In this direction, we will present in the following paragraphs a redesign path of a museum environment to increase its accessibility through innovative and technological solutions and the co-participation of people with disabilities. From describing the research design and the activities carried out, we will present the entire process to customise the museum visit. We will specifically focus on the illustration of a single path co-designed with people with intellectual disabilities for the realisation of accessible museum captions—in Easy-to-Read language—with the support of new technologies, namely Artificial Intelligence.

2. The research design

As mentioned in the previous paragraphs, the Special Pedagogy research group from the University of Macerata launched a project, to be conducted between 2022 and 2024, to create a museum exhibition that would make the visit experience more accessible.

To this end, co-design strategies with people with disabilities were implemented to support the rearrangement procedures through solutions informed by the *expertise* of the stakeholders. Participatory research (Cornwall, 1995) characterised the project from a methodological point of view, orienting the design, development and implementation of accessibility solutions and distinguishing it for its highly participatory nature and the active involvement of people with disabilities.

In particular, *focus groups* were created (Liamputtong, 2011) involving people with disabilities to map accessibility needs and identify inclusive strategies for implementing the chosen museum path. The participants' contributions were analysed through *Qualitative Content Analysis* (Schreier, 2012) to develop a theoretical framework to identify the potential and limits of museum accessibility. The choice of co-designing with people with disabilities allowed us to synergize different skills by creating an inclusive museum context, responding to the real needs of all visitors.

For these reasons, the presented project represents a case study (Thomas, Myers, 2015), providing insights that can lead to significant transformations in the field of our interest, namely museum accessibility.

Based on these assumptions, participatory research was based on the following procedural steps (Giaconi *et al.*, 2023):

- a. Mapping of critical issues related to the accessibility, both physical and cultural, of the museum context involved in the project (6 months);
- b. Co-design of integrated solutions with stakeholders to develop and test accessible and inclusive museum paths (6 months);
- c. Development of integrated solutions aimed at the usability of museum spaces and contents (9 months);
- d. Re-test of implemented solutions (3 months).

With reference to the project's activities, to redesign a museum environment that meets both physical accessibility and cultural inclusion criteria, the research team was composed of engineers and architects, art historians and archaeologists, pedagogists, Easy-to-Read experts, educators and people with disabilities affiliated with different associations of the Marche region.

Regarding the topic discussed in this contribution, we will briefly present the co-design phase of integrated solutions with stakeholders to develop and test accessible and inclusive museum paths (procedural step "b").

3. Co-design of integrated solutions with stakeholders

In line with the regulatory provisions on the renewal of museum accessibility and inclusion plans (PEBA, 2018) and in continuity with scientific literature (Balcazar et al., 1998; Giaconi et al., 2021; Giaconi et al., 2023; Paladini et al., 2023; Chiatti et al., 2023), a process of co-design with people with disabilities was initiated to develop new integrated paths to be realised within the museum environment.

Specifically, concerning the mapping of critical issues related to both physical and cultural accessibility and to the solutions hypothesised in the *focus groups*, three macro-paths were formulated (Giaconi *et al.*, 2023), as follows:

- a) Easy-to-Read (co-design of integrated solutions with people with intellectual disabilities);
- b) Tactile and Haptic (co-design of integrated solutions with people with sensory disabilities);
- c) Virtual Reality (VR) and Augmented Reality (AR) (co-design of integrated solutions with people with Autistic Spectrum Disorder).

In the next paragraphs, we will detail the “Easy-to-Read” path (a) and the implementation phases carried out during the co-design of integrated solutions with people with intellectual disabilities.

For the “Tactile and Haptic” path (b), the co-design of integrated solutions with people with sensory disabilities involved implementing Braille captions, creating LOGES# tactile paths, and realising 3D reproductions of significant museum objects. In addition, a haptic station that simulates the sense of touch in a virtual environment was created. The tactile path was also integrated with a Tactile Map and provided different types of tactile tiles in the flooring, each corresponding to specific tactile codes².

With reference to the “Virtual Reality (VR) and Augmented Reality (AR)” path (c), the research group focused on the development of immersive and innovative environments for multimodal interaction, in particular for people with Autistic Spectrum Disorder. The co-design phase began with data collection to construct the virtual prototype. The working group chose the main rooms that characterise the museum, taking spherical photos with a 360° camera and creating three-dimensional environments. Using different tools and software³, the prototype was calibrated according to the principles of *Universal Design for Learning* (Rappolt-Schlichtmann, Daley, 2013; Savia, 2016) and was structured to meet the needs of people with Autistic Spectrum Disorder (e.g. predictability and anticipation of spaces; the need for real and visual images to understand reality; accessibility to cultural objects and content; clarification of symbols, codes and signs in the museum) (Giaconi *et al.*, 2021).

Lastly, the three routes were designed to be used in an integrated way. These solutions were included in an application developed for the customisation of visiting routes (Giaconi *et al.*, 2023). The main access route for the provision of customised solutions is, in fact, an App that, thanks to the use of multiple languages, innovative interactive modes and customizable solutions, makes the

² These codes include directional indications, warnings of passable hazard, attention-service, required turn at 90°, X or T crossings, and removable tactile strips to signal stairs and handrails.

³ Among the main tools used, we mention: a spherical camera Ricoh Theta SC2, a smartphone equipped with Android 6.0 operating system, the Ricoh Theta S applications, Ricoh Theta Converter Pro, Retouch3 and Marzipano Tool⁴ which is a free web service based on an open-source library. In particular, the file compressed in.zip format returned by Marzipano Tool, is composed mainly of JavaScript, CSS and HTML code, being freely editable, it is possible to rewrite it in some places to get a better customisation of the contents.

museum experience accessible to an increasingly diverse audience (Fig. 1). In addition, among its functions, the App allows the use of content and spaces also on occasions other than the in-person museum visit. These prerequisites facilitate the design and organisation of educational activities, both before the visit to the museum and as a support to the consolidation of learning after the museum experience. The intuitive interface, designed according to the principles of *Universal Design for Learning* (Story, Mueller, Mace, 1998; Rappolt-Schlichtmann, Daley, 2013) integrates tactile inputs, voice and visual information, allowing users to interact with virtual objects in a realistic and engaging way, thus making usable, in an alternative way, the artefacts stored in the museum.

Fig. 1 – Application developed for the customisation of visit routes



4.1 The "Easy-to-Read" path

There are numerous useful international guidelines and recommendations (Tronbacke, 1997; Freyhoff *et al.*, 1998; Fajardo *et al.*, 2014; Bernabé Caro, Orero, 2019; Madina, Gonzalez-Dios, Siegel, 2023) for the design of accessible information, through clear, direct and simple language.

Adapting documents in Easy-to-Read language is a cyclical process and involves three procedural steps: analysis, transformation and validation. Through these

steps, the active involvement of people with intellectual disabilities and experts in Easy-to-Read allows the production of information that effectively meets accessibility criteria. However, such participation requires a significant commitment and use of human resources, and scholars have sought alternative solutions (Suárez-Figueroa *et al.*, 2020). In this regard, several semi-automatic systems based on Artificial Intelligence have been proposed, such as *Large Language Models* (LLMs) like ChatGPT, launched by OpenAI. These promising tools can give significant contributions to solving natural language processing tasks (Min *et al.*, 2023; Liu *et al.*, 2023; Araújo, Aguiar, 2023) to support the analysis of texts and verify their compliance with the Easy-to-Read guidelines (Suárez-Figueroa *et al.*, 2020). In detail, several methods of automatic simplification of sentences based on supervised and unsupervised machine learning techniques have been proposed over the years (Nisioi *et al.*, 2017; Kumar *et al.*, 2020). With reference, for example, to automatically transform reading materials based on Easy-to-Read guidelines, a relevant approach that can be applied is the so-called “simplification of sentences”. Such an approach consists of “modifying the content and structure of a text to make it easier to read and understand, preserving the main idea and approaching the original meaning” (Alva-Manchego, Scarton, Specia, 2020, p. 135).

These considerations encourage us to reflect on using the same semi-automatic systems based on Artificial Intelligence (specifically the *Large Language Model* ChatGPT⁴) since they are functional to support adapting information in Easy-to-Read. Being aware that AI systems can offer “opportunities to improve and multiply the possibilities of human action” (Floridi, 2022, p.284), we intend to use such systems as possible tools to optimise co-design processes rather than substituting them.

In this sense, using LLMs to create Easy-to-Read texts was carried out in full compliance with the guiding principles proposed by the *Inclusion Europe* movement⁵. Therefore, in all the procedural steps of transforming the texts into Easy-to-Read through the use of LLM systems, up to the testing and re-testing of the content produced, people with intellectual disabilities experienced in Easy-to-Read were involved in verifying effective adherence to the criteria of the same guidelines and those of content accessibility.

⁴ This system is reported as the best in terms of writing, compared to user ratings (Uricchio *et al.*, in press).

⁵ <https://www.inclusion-europe.eu/easy-to-read/>

The specific implementation phases carried out are illustrated below.

4.1.1 The Implementation Protocol

In the preliminary phase, the level of knowledge of ChatGPT related to the Easy-to-Read guidelines was assessed by submitting to the chat questions to assess its adherence to guidelines.

In line with the reference literature (Min *et al.*, 2023), a test consisting of 10 open questions was prepared, formulated by the research team assisted by experts on the Easy to Read Guidelines, to which the LLM responded freely, without any predefined structure.

The questions were sent to various versions of ChatGPT (3.5 and 4.0) using the *OpenAI* API with a *Python* script.

The results showed that ChatGPT 4.0 appears to know Easy-to-Read guidelines well.

Based on the data emerging from this evaluation, a specialised prompt was built to direct ChatGPT 4.0 towards producing a text strictly adhered to the Easy-to-Read guidelines. In detail, the prompt included: a) a contextual background to direct the model to act as an accessibility expert; B) a detailed presentation of the Easy-to-Read guidelines; and c) explicit instructions to apply the guidelines in simplifications.

Subsequently, the “trained” tool to produce simplified information was used to draft 10 simplified museum captions.

These products of “trained” ChatGPT 4.0 were subjected to the evaluation of the working group, composed of experts in Easy-to-Read with and without disabilities (people with intellectual disabilities, pedagogists, art historians, and archaeologists), who assessed their specific adherence to the guidelines through a Likert scale from 1 to 5:

1- Completely incorrect: it significantly deviates from the guidelines, it does not meet the basic standards for an easy understanding.

2- Not sufficiently correct: it shows an attempt to align with the guidelines but fails to meet several important aspects.

3- Sufficiently correct: it adequately meets the guidelines, ensuring a basic level of easier understanding.

4- More than sufficiently correct: it meets the basic requirements of the guidelines but could be improved.

5- Completely correct: it adheres perfectly to the guidelines.

In addition to these quantitative assessments, experts were asked to provide qualitative feedback on each text, highlighting strengths and areas of improvement. This dual approach made it possible to fully understand the alignment of each text with the Easy-to-Read principles and to identify the specific elements that contributed or not to the accessibility criteria (Table 1). The quantitative and qualitative data collected during this re-test phase guided the subsequent phases of re-designing the system and optimizing the texts.

Table 1 – Easy-to-Read facilitation process: from the original text to the latest version prepared by the research team after the review process.

Testo Originale⁶

Ultima versione del testo facilitato,
realizzato grazie al processo di co-
progettazione⁷

⁶ Authors' traduction of the original text: "The Picenian aristocracies used to gather for common meals (banquets or symposia).

This was a custom typical of many ancient civilisations and its introduction in the Picenian area is linked to an influence from the Greek world, also well attested among the Etruscans.

In the grave goods of the tombs of Tolentino we often find objects that can be traced back to the banquet, especially vases related to the pouring of wine.

Among the most representative vessels we find: craters, large vases for preparing wine; stamnoi and amphorae, medium-large vessels for storing liquids; small jugs (oinochoi); vessels of various shapes used for drinking such as kilikes, large bowls on feet with two handles, and skyphoi, smaller and deeper.

Many of these objects are imported from Greece, Magna Graecia or Etruria and testify to the wealth of the Picenian aristocracies and their adherence to a Mediterranean culture.

The scenes depicted on some of the objects found and, in particular, on the vases, are often related to myth or typical Greek banquet customs such as representations of Heracles or Dionysian scenes. If Dionysus is in fact the god who gave wine to mankind, Heracles constitutes the symbolic figure of the aristocracies as a man welcomed among the divinities for his merits.

At the banquet, other objects were also used for both the preparation and consumption of wine and meat. In fact, we find, among the accompanying objects, basins and other bronze vessels, strainers and graters, as well as winged and skewered. The preparation of wine was, in ancient times, a rather complex process involving, for example, the use of spices and flavourings, dilution with water, heating and filtering".

⁷ Authors' traduction of the final version of the text: "The richest and most powerful Picenian families were called aristocrats. Aristocratic families gathered to have meals together. These meals were called banquets or symposia. In the tombs of Tolentino we often find objects that were used at banquets to show that the person was important. Among these objects we find vases that were used to mix wine with water and some spices and aromas. In ancient times, in fact, it took a long time to prepare wine and that is why jars were used. Vases were therefore very important objects that were buried together with the person, i.e. they were part of the grave goods. On these vases are depicted the images of Dionysus and Heracles. Dionysus is the god of wine. Heracles is such a heroic man that he was considered a god. Heracles represents what aristocratic families wanted to do and be. In the grave goods of the Tolentino tombs, these vases were found: Craters, which are large vessels for preparing wine; Stamnoi and amphorae, which are smaller vessels for storing liquids; Small jugs (oinochoi); Other drinking vessels, either cup-shaped (kilikes) or smaller (skyphoi)".

Le aristocrazie picene usavano riunirsi in occasione di pasti comuni (banchetti o simposi).

Si tratta di un'usanza tipica di molte civiltà antiche e la sua introduzione in area picena è legata ad un'influenza proveniente dal mondo greco, ben attestata anche tra gli Etruschi.

Nei corredi delle tombe di Tolentino troviamo spesso oggetti riconducibili al banchetto, in particolar modo vasellame legato alla mescolta del vino.

Tra i vasi più rappresentativi troviamo:

- crateri, grandi vasi per la preparazione del vino;
- stamnoi e anforette, vasi di medio-grandi dimensioni utili alla conservazione dei liquidi;
- piccole brocche (oinochoi);
- recipienti di varia forma utilizzati per bere come le kilikes, larghe coppe su piede con due anse, e gli skyphoi, più piccoli e profondi.

Molti di questi oggetti sono importati dalla Grecia, dalla Magna Grecia o dall'Etruria e testimoniano la ricchezza delle aristocrazie picene e la loro adesione ad una cultura mediterranea.

Le scene rappresentate su alcuni degli oggetti rinvenuti e, in particolar modo, sui vasi, sono spesso relative al mito o

Le famiglie picene più ricche e potenti si chiamavano aristocratiche.

Le famiglie aristocratiche si riunivano per fare pasti insieme.

Questi pasti si chiamano banchetti o simposi.

Nelle tombe di Tolentino troviamo spesso oggetti che si usavano nei banchetti per dimostrare che quella persona era importante.

Tra questi oggetti troviamo dei vasi che venivano usati per miscelare il vino con l'acqua e alcune spezie e aromi. In antichità, infatti, serviva molto tempo per preparare il vino e per questo motivo si usavano i vasi.

I vasi erano quindi oggetti molto importanti che venivano seppelliti insieme alla persona, ovvero facevano parte del corredo funebre.

Su questi vasi sono raffigurate le immagini di Dioniso ed Eracle.

Dioniso è il dio del vino.

Eracle è un uomo tanto Eroico che era considerato un Dio.

Eracle rappresenta quello che le famiglie aristocratiche volevano fare ed essere.

Nei corredi funebri delle tombe di Tolentino sono stati trovati questi vasi:

<p>alle usanze tipiche del banchetto greco come le rappresentazioni di Eracle o di scene dionisiache. Se Dioniso è infatti il dio che ha donato il vino agli uomini, Eracle costituisce la figura simbolo delle aristocrazie in quanto uomo accolto tra le divinità per i suoi meriti.</p> <p>In occasione del banchetto anche altri oggetti venivano utilizzati sia per la preparazione</p> <p>e il consumo del vino che delle carni. Troviamo infatti, tra gli oggetti di corredo, bacini e altri recipienti in bronzo, colini e grattugie ma anche alari e spiedi. La preparazione del vino era, anticamente, un processo piuttosto articolato che prevedeva, ad esempio, l'uso di spezie e aromi, la diluizione con acqua, il riscaldamento e il filtraggio.</p>	<p>Crateri, che sono grandi vasi per preparare il vino;</p> <p>Stamnoi e anforette, che sono vasi più piccoli per conservare i liquidi;</p> <p>Piccole brocche (oinochoi);</p> <p>Altri vasi per bere, a forma di coppa (kilikes) o più piccoli (skyphoi).</p>
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4. Conclusions

This contribution highlights how, within cultural spaces, particularly museums, it is possible to realise paths aimed at protecting and guaranteeing plural forms of accessibility. Such an approach is supported by guidelines that emphasise the cruciality of museums in promoting individual and collective identity by constructing an accessible heritage (Council of Europe, 2017; P.E.B.A., 2018; ICOM, 2022). According to these considerations, museums can increase their credibility and authority by committing to cultural accessibility and building relationships with government institutions and the community (ICOM, 2022). Therefore, it is essential to launch projects involving increasing collaborations with stakeholders to promote an increasingly inclusive culture.

As also highlighted in other works (Giaconi *et al.*, 2021; Shogren *et al.*, 2022), the active involvement of persons with disabilities can play a significant role in the development of cultural contexts accessible to all. The starting point was

understanding the needs that people with intellectual and sensory disabilities experience in museum contexts and then discussing and designing the requirements of the proposals to be collectively developed. This study highlights how co-design work with people with disabilities can foster the development and enhancement of inclusive museum pathways, creating synergies within which the museum's cultural activities and social inclusion mutually reinforce each other (Giaconi *et al.*, 2021; Shogren *et al.*, 2022). Co-designing with different professionals and people with disabilities represents a significant process that has led to the creation of inclusive museum paths and enhancing the personal and social empowerment of the people involved.

In addition, this participatory approach made it possible to accurately identify the essential functionalities and specific requirements of the tested digital solutions. In line with the principles of UDL (Rappolt-Schlichtmann, Daley, 2013; Savia, 2016) and with relevant literature (Fiorucci, Pinnelli, 2013; Del Bianco *et al.*, 2019; Pacinotti, 2019; Perego, 2019), it seems significant in our opinion to promote a synergistic integration between technology and innovation, useful to increase the active involvement of all museum users (Solima, 2007; Carci, Gaforio, Gamper, 2019). Specifically, we focused on the accessibility of simplified texts in Easy-to-Read, exploiting AI's potential and the competencies of people with disabilities directly involved (Floridi, 2022). In this direction, future research trajectories could be centred around developing strategies for co-designing prompts to facilitate textual content with people with intellectual disabilities experienced in Easy-to-Read.

As this work underlines, the focus on reciprocity and relationality is crucial to creating generative spaces for development and further capitalising on the capacity of sharing and mutual involvement (Giaconi *et al.*, 2023). Through micro and macro actions in ecosystemic contexts, it is possible to promote the active participation of people with disabilities and thus develop an inclusive culture (Molinari *et al.*, 2022).

Only include indispensable images or drawings or graphics in the article and check that they are saved in a format readable by all computers. Images, graphs and tables must be captioned with a number. References in the article to the image should indicate its type and number (e.g. Fig. 1; Graph.2; Tab. 3).

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6.800	67,07	29,18	34,00	155,04	6.581,78	315,52	6.421,30	537,20	6.199,62	893,52	5.843,30	1.522,52	5.214,30
6.900	68,05	29,61	34,50	157,32	6.678,57	320,16	6.515,73	545,10	6.290,79	906,66	5.929,23	1.544,91	5.290,98
7.000	69,04	30,04	35,00	159,60	6.775,36	324,80	6.610,16	553,00	6.381,96	919,80	6.015,16	1.567,30	5.367,66
7.100	70,03	30,47	35,50	161,88	6.872,15	329,44	6.704,59	560,90	6.473,13	932,94	6.101,09	1.589,69	5.444,34
7.200	71,01	30,89	36,00	164,16	6.968,95	334,08	6.799,03	568,80	6.564,31	946,08	6.187,03	1.612,08	5.521,03
7.300	72,00	31,32	36,50	166,44	7.065,74	338,72	6.893,46	576,70	6.655,48	959,22	6.272,96	1.634,47	5.597,71
7.400	72,99	31,75	37,00	168,72	7.162,53	343,36	6.987,89	584,60	6.746,65	972,36	6.358,89	1.656,86	5.674,39

Table 1 (description)

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