Erasmus+ 2023-2-IT02-KA210-ADU-000177194

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Digital Spektrum

Digital Skills and Technologies for Promoting Cultural Inclusion in Museum Users with Autism Spectrum Disorders

TOOLKIT FOR MUSEUM PROFESSIONALS

DIGITAL-SPEKTRUM

Erasmus+

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1. Introduction

Museums today are increasingly recognised as inclusive cultural and educational spaces that welcome diverse audiences and foster participation (ICOM, 2022). The COVID-19 pandemic has further accelerated the digital transformation of the cultural sector (NEMO, 2020; ICOM, 2020; UNESCO, 2020), highlighting the urgent need to equip museum professionals with appropriate digital skills and tools. This need is particularly pressing when addressing the requirements of people with Autism Spectrum Disorders (ASD), who often face barriers to full participation in cultural experiences.

The Digital-Spektrum project responds to these challenges by offering a structured framework for digital upskilling, tailored specifically to the needs of museum professionals involved in the design and delivery of inclusive experiences. By combining digital innovation, inclusive design, and autism-specific knowledge, this project aims to promote equity and accessibility in the museum sector, in line with the European agenda for inclusion, digital transformation, and lifelong learning (European Council, 2021/C 221/02).

1.1 Presentation of the project

The Digital-Spektrum project is an initiative that aims to strengthen the capacity of museum professionals to create inclusive and autism-friendly educational experiences through the use of digital technologies. The project is grounded in the recognition that museums play a vital role in the promotion of diversity and social inclusion, and that digital tools can enhance their capacity to respond to specific educational needs.

At the core of the project is the intention to develop and promote a Toolkit for Museum Professionals that provides methodologies, practices, and digital instruments to support accessible, engaging, and meaningful learning for visitors with ASD. The toolkit is the result of collaborative efforts among educators, researchers, and museum practitioners across Europe, and builds upon key methodologies such as Object-Based Learning, Digital Storytelling, and the use of digital technologies for well-being.

The target audience of the project includes both front-of-house staff—such as educators, guides, guards, and ticketing staff—and back-of-house professionals like curators and technicians. Particular attention is given to museum educators and guides, who are crucial in co-designing and implementing adaptive and inclusive workshops and learning activities tailored to the needs of ASD visitors.

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1.2 Objectives

The Digital-Spektrum project addresses three interrelated priorities:

1. Promoting inclusion and diversity in education through museums, by enabling staff to design educational experiences that are adaptable to the needs of people with ASD;
2. Fostering digital transformation in the cultural and creative sectors, by supporting the development of digital readiness, resilience, and capacity among museum professionals;
3. Improving the competences of museum staff, particularly in relation to inclusive design, digital innovation, and autism awareness, as a way to enhance both visitor experience and staff employability.

More specifically, the project aims to:

- Train museum professionals to acquire and apply digital skills in the creation of inclusive, autism-friendly learning experiences;
- Promote knowledge and awareness about Autism Spectrum Disorders among museum staff;
- Support the design, implementation, and evaluation of inclusive museum practices that integrate digital technologies in meaningful ways;
- Build digital confidence and cultural awareness across the museum workforce, regardless of role or seniority, to meet the evolving demands of a digitised society (Poce, 2019; OCSE, 2018; European Commission, 2017; Conceptual Framework of Digital Competences for Culture and Creative Industries, O1.1).

Digital-Spektrum addressed the identified needs of museum professionals in terms of upskilling, training, and developing new competences. Ultimately, the project responds to the broader need for museum staff to actively contribute to making museums more inclusive and better aligned with the evolving needs of society. In doing so, the project ultimately contributes to the consolidation of museums as spaces of active inclusion, where digital tools serve not as barriers but as enablers of meaningful participation for all.

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1.3 Participating organisations

UNIVERSITA' DEGLI STUDI DI ROMA TOR VERGATA - ROME, ITALY

TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

The Department of History, Cultural Heritage, Education and Society of the University of Rome Tor Vergata was established in July 2015 as part of a restructuring of the Macro-area of Humanities. The core is represented by the disciplines of education, history, archaeology, geography, music and performing arts, and foreign languages and literatures. Its composition was subsequently opened up to the participation of other sectors, also in view of the expansion of the teaching offer and the promotion of the interdisciplinary dimension of research. Scientific collaboration with other disciplines is a guiding criteria for various research activities and crosses departmental boundaries in a constant effort to increase cooperation and exchange with fields other than the humanities.

Website:
https://web.uniroma2.it/en/contenuto/department_of_history__culture_and_society

MUSEU NACIONAL D'ART DE CATALUNYA - BARCELONA, SPAIN

MUSEU
NACIONAL
D'ART DE
CATALUNYA

The Museu Nacional d'Art de Catalunya (MNAC), as a public organisation, boosts the social and educational use so as to become a space of knowledge, debate, a social tie and one of participation, placing knowledge, the collection and the resources at the

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service of the public. The museum aims to show the Catalan artistic expression without chronological limits, and at the same time generate new knowledge, the result of the research and work with other institutions. The programming of the museum, within its vocation to be a public service, is focused on opening up to new publics; boosting knowledge and research, and a greater national and international projection of the institution.
The MNAC has 5 strategic lines of action: Social dimension: accessibility, inclusion and sustainability; The collection: new stories, expansion and diffusion; Knowledge, education and experiences; Importance and impact; Governance, organisation and funding.

Website: https://www.museunacional.cat/en

VIA ARTIS NGA - VINCENNES, FRANCE

Via Artis NGA (France) is an educational and cultural organisation dedicated to promoting inclusive lifelong learning through the arts, heritage, and museum practice. Drawing on expertise in art history and museum education, it develops creative approaches that make cultural experiences accessible to diverse audiences. Via Artis integrates digital storytelling as a central pedagogical method, using it to foster engagement, self-expression, and understanding across cognitive and sensory differences. Through collaborations with museums, educators, and cultural institutions, Via Artis NGA designs and implements learning environments that encourage participation and inclusivity, combining digital media with hands-on, object-based learning. Its work emphasises the social role of museums as spaces for shared learning, supporting both professionals and learners in reimagining cultural access and educational equity.

Website: https://via-artis.fr

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1.4 Main concepts

Object-based Learning

Object-Based Learning (OBL) is an educational methodology that uses direct interaction with real or digital museum objects to support meaningful, personalised, and multisensory learning. Within the Digital Spektrum project, OBL was adapted to address the specific needs of people with Autism Spectrum Disorder (ASD) by integrating digital tools and a participatory design approach.

The OBL workshop carried out under WP2 was designed to train museum professionals in how to plan, implement, and evaluate inclusive digital object-based activities for ASD audiences. The training covered:

- An introduction to the characteristics and needs of people with ASD in museum settings;
- Identification of the digital skills and tools necessary to implement OBL methodologies effectively;
- The use of a participatory co-design approach to develop workshop content tailored to ASD learners;
- Strategies to facilitate emotional and personal connections with museum collections through object engagement.
- The adaptation of OBL for ASD audiences requires:
- Structuring activities into clear, predictable steps to reduce ambiguity and cognitive load;
- Selecting objects that spark interest without triggering sensory overload;
- Using digital resources that allow participants to visualise, manipulate, or explore objects in accessible formats;
- Providing alternative communication methods, such as visual supports, pictograms, and assistive technologies.

During the workshop, participants co-designed example activities using collection objects as a starting point for inclusive educational experiences. The approach demonstrated how OBL can be used to validate multiple perspectives, support autonomy, and promote active cultural participation among neurodiverse audiences.

Ultimately, the Object-Based Learning approach, when adapted with digital tools and inclusive strategies, enables museums to act as flexible, welcoming environments that foster cultural inclusion and emotional well-being.

Digital Storytelling

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The concept of Digital Storytelling for Well-being (DT for WB), as developed in the framework of the Digital Spektrum project, is grounded in the belief that personal and emotional engagement with museum collections can foster accessibility, inclusion, and emotional well-being, particularly for neurodiverse audiences such as individuals with Autism Spectrum Disorder (ASD).

Digital Storytelling (DS) is understood as a five-step creative process in which participants engage with cultural artefacts, develop a personal narrative, and create a digital artefact (e.g., a video or interactive media) that reflects their interpretation or emotional response. Within the museum context, DS facilitates a shift from a cognitive to an emotional engagement with collections, allowing ASD visitors to establish personal meaning and reduce interpretative barriers.

In the context of the project, the DT for WB methodology was adapted specifically for ASD learners through a participatory workshop (WP3), where museum staff explored:

- The needs and characteristics of ASD visitors;
- The challenges and opportunities of adapting the conventional DS model;
- The digital tools and transversal skills required to implement inclusive storytelling activities in museums;
- The importance of narrative co-creation, especially in relation to ASD-specific communication profiles.

Through collaborative learning environments, the workshop promoted reflection on how storytelling can be used to validate multiple perspectives on the same object, reinforcing a sense of cultural belonging and shared humanity.

It also addressed barriers inherent to the DS process, particularly those linked to the social aspects of narrative creation, which can pose specific difficulties for people with ASD. Strategies were developed to define inclusive entry points to storytelling, reduce social stressors, and encourage alternative forms of expression.

By empowering museum professionals with these insights and tools, DT for WB becomes a methodology not only for cultural inclusion but also for personal growth, emotional regulation, and social connection among neurodiverse audiences.

Digital Technologies for Well-being

The concept of Digital Technologies for Well-being (DT for WB) within the Digital Spektrum project refers to the use of digital tools to enhance the accessibility, inclusion, and emotional well-being of museum visitors with Autism Spectrum Disorder (ASD). Rather than focusing solely on efficiency or innovation, DT for WB prioritises human-centred design, neurodiversity, and the creation of supportive environments.

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In the WP4 workshop, the Museu Nacional d'Art de Catalunya (MNAC) conducted a practical session to explore and evaluate a prototype webApp titled ***Spektrum TEA i inclusió als museus: guia per a professionals***. This digital tool was developed to assist museum professionals in implementing inclusive strategies through a structured, role-based format tailored to different museum functions.

The concept of DT for WB in this context emphasises:

- Empowering museum professionals with actionable digital resources to understand and respond to the needs of ASD visitors;
- Providing role-specific pathways and scenarios that reflect real-life challenges in museums;
- Enhancing institutional awareness and promoting cross-departmental collaboration for inclusive practice;
- Supporting decision-making and reflection through interactive and visual formats.
- The webApp experience was structured around:
- Theoretical grounding in ASD awareness and cognitive-behavioural considerations;
- A live digital demonstration of the tool's functionalities;
- A hands-on activity, where professionals used the webApp to analyse a fictional scenario involving an ASD visitor and proposed inclusive solutions;

A dual evaluation, combining individual feedback on skills gained and collective assessment of the tool's usability.

This activity demonstrated how digital technologies can be applied not only as assistive tools, but also as frameworks for training, collaboration, and reflection. The DT for WB approach in the project highlights the need for practical, flexible, and scalable tools that respond to diverse institutional contexts and user profiles.

Ultimately, DT for WB reinforces the museum's role as a socially inclusive and emotionally supportive space, where digital innovation directly contributes to visitor well-being and staff competence.

1.5 Methodology

The methodological framework underpinning the Digital Spektrum project was designed to strengthen museum professionals' capacity to design, implement and evaluate inclusive educational activities for visitors with Autism Spectrum Disorders (ASD) through the integration of digital tools and creative pedagogies.

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Across the three workshops developed within Work Packages 2, 3 and 4, partners adopted experiential, participatory and reflective methodologies, combining theoretical grounding with hands-on practice, collaborative experimentation and continuous evaluation. Each workshop explored a specific approach to inclusion through digital culture, forming a coherent methodological progression.

1. Object-Based Learning (WP2 – University of Rome Tor Vergata, Rome)

The first workshop introduced museum staff to digital Object-Based Learning (OBL) as a method for promoting sensory, cognitive and emotional engagement among ASD learners.
Participants were guided through the design of learning experiences centred on direct interaction with objects—both real and digitally reproduced through 3D scanning and printing.
The methodology integrated Kolb's experiential learning cycle, tactile learning, and the use of thinking routines ("I See – I Think – I Wonder") to support observation and reflection.
By blending physical manipulation, digital replication and structured facilitation, this workshop demonstrated how OBL can enhance accessibility and foster inclusive participation in museum contexts.

2. Digital Storytelling (WP3 – Via Artis NGA, Paris)

The second workshop focused on Digital Storytelling (DS) as an inclusive practice to support empathy, creativity and self-expression in museum education.
Through a combination of narrative exploration, co-design and sensory engagement, participants learned how to adapt the five-step DS process (story conception, script writing, recording, editing, and sharing) to the needs of ASD and neurodivergent audiences.
The methodology emphasised the use of museum objects as narrative triggers, inviting participants to connect personal meaning with cultural heritage.
Collaborative reflection and the use of digital platforms (e.g. the MyIntellect online learning environment and the Smithsonian Learning Lab) allowed participants to extend learning beyond the in-person session, reinforcing storytelling as a tool for inclusive audience engagement.

3. Digital Technologies for Well-being (WP4 – Museu Nacional d'Art de Catalunya, Barcelona)

The final workshop explored Digital Technologies for Well-being (DT for WB) in museums, focusing on how digital environments can foster comfort, inclusion and emotional regulation for ASD visitors.
The methodology combined participatory design, cross-departmental collaboration and scenario-based training, allowing professionals to simulate real-life accessibility challenges and co-develop inclusive responses.

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Participants tested and evaluated the Spektrum webApp, a prototype digital guide offering role-based scenarios to support museum staff in addressing ASD-related situations.
Through this iterative, user-centred approach, the workshop operationalised the concept of well-being through digital care, framing technology as a facilitator of empathy and institutional reflection.

An integrated methodological approach
Together, the three workshops formed an integrated learning pathway built on shared principles:

- Experiential learning: learning by doing and reflecting on real museum practices;
- Participatory design: co-creation of inclusive tools and educational scenarios;
- Blended learning: combination of in-person and online environments to foster continuity;
- Evidence-based reflection: use of evaluation tools to assess well-being, empathy and digital skills.

This methodological ecosystem enabled museum professionals to acquire not only digital and pedagogical competences, but also a transformative understanding of inclusion, grounded in empathy, creativity and collaborative innovation.

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2. Results

The results presented in this section reflect the collective outcomes of the three capacity-building workshops developed within the Digital Spektrum project. Each workshop explored a specific methodological approach - Object-Based Learning (WP2), Digital Storytelling (WP3), and Digital Technologies for Well-being (WP4) - while contributing to a shared objective: strengthening the ability of museum professionals to design accessible, engaging and autism-responsive learning experiences supported by digital tools.

Across Rome, Paris and Barcelona, more than one hundred museum professionals and cultural mediators participated in blended training activities combining theoretical grounding, practical experimentation, digital exploration and reflective evaluation. The workshops enabled participants to deepen their understanding of Autism Spectrum Disorders, develop transversal and digital competences, and experiment with concrete strategies for inclusive mediation.

Section 2.1 summarises the results of the three workshops, documenting their structure, participation, learning outcomes and evaluation findings.
Section 2.2 presents best practice examples that capture transferable models and methodologies emerging from each workshop.
Section 2.3 offers recommendations from the three partner institutions, translating the lessons learned into actionable guidance for museums wishing to advance digital inclusion and accessibility.

Together, these results demonstrate how digital innovation, when grounded in pedagogical care, collaborative design and neurodiversity awareness, can expand the capacity of museums to become truly inclusive spaces of cultural participation.

2.1 Results of the workshops

Object-based learning workshop for museum professionals - University of Rome Tor Vergata

The workshop organised by the University of Rome Tor Vergata within the framework of WP2 focused on the development of digital Object-Based Learning (OBL) practices to support the inclusion of visitors with Autism Spectrum Disorder (ASD) in museum settings. The main goal was to train museum professionals in designing, conducting and evaluating inclusive educational activities enriched by digital tools, 3D technologies and participatory methodologies.

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Workshop structure and participation

The workshop combined an on-site session held at Palazzo Merulana in Rome and online follow-up activities hosted on a dedicated learning platform. A total of 30 museum professionals and educators participated, including in-service practitioners and students in training. Their backgrounds ranged across educational services, visitor engagement, heritage interpretation and research, enabling vibrant interdisciplinary dialogue.

The session followed a multi-step structure:

1. Introduction to the Digital Spektrum project, its priorities, aims and expected impact on museum practices.

2. Expert contributions on digital transformation in museums, highlighting accessibility and inclusion as key guiding principles.

3. Introduction to the Object-Based Learning methodology, including experiential learning principles, the Kolb cycle, and the role of sensory and narrative engagement in ASD-responsive museum experiences.

4. Hands-on OBL activities using 3D-printed replicas and digital microscopes, supported by the "I See – I Think – I Wonder" thinking routine to foster structured and accessible interaction.

5. Training on 3D scanning and printing, where participants experimented with accessible apps and learned the workflow from scanning to slicing and printing.

6. Presentation of evaluation tools supporting the assessment of well-being, empathy and emotional response in inclusive museum workshops.

7. Access to online modules including virtual exhibitions, collaborative environments, and repositories of manipulable 3D objects, enabling continued practice and reflection.

Main results and outcomes

- **Strengthened understanding of ASD needs:** Participants gained structured knowledge of sensory, cognitive and behavioural dimensions relevant to museum accessibility.

- **Adoption of a digital OBL approach:** The hands-on component demonstrated how 3D replicas and digital visualisation tools can democratise object access

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and support inclusive learning.

- **Development of practical digital skills:** Participants learned how to use user-friendly 3D scanning apps and slicing software, improving confidence in applying digital tools in their work.

- **Increased readiness for inclusive design:** The workshop promoted a shift from individual initiatives to shared institutional responsibility for inclusion.

Evaluation and feedback

An online evaluation questionnaire was completed by all 30 participants during the in-presence session. Results show:

- High satisfaction with the workshop's relevance and clarity.

- Consistent self-reported improvement in professional, transversal and digital skills.

- Strong intention to apply the acquired methods in future museum activities, particularly in educational and mediation contexts.

The positive feedback demonstrates that the workshop successfully supported participants in developing competencies, awareness and practical tools to make cultural heritage spaces more accessible, engaging and inclusive for ASD visitors. The blended design and the balance between theory, hands-on practice and digital experimentation were particularly appreciated.

Digital storytelling workshop for museum professionals – Via Artis NGA

As part of the Digital Spektrum project, this workshop focused on equipping museum professionals and students in cultural mediation with competencies in Digital Storytelling as an inclusive educational tool for audiences with Autism Spectrum Disorder (ASD) and other Neurodevelopmental Disorders (NDD). Anchored in participatory and experiential methodologies, the training highlighted how when supported by digital resources, material prototypes and accessible learning environments, storytelling can serve as an inclusive mediation tool. Participants explored how Digital Storytelling enables emotional engagement with collections, validates multiple narratives and supports more equitable forms of cultural participation.

Workshop structure and participation

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The workshop combined an in-person session hosted at the Petit Palais in Paris with structured online learning delivered through dedicated platforms. Twenty-one museum professionals and educators attended the on-site activities, while approximately thirty participants engaged with the follow-up digital course components at the time. The cohort represented a heterogeneous group: museum educators, cultural mediators, public engagement specialists, guide-lecturers, university teachers in heritage and mediation, as well as students in cultural mediation and arts education. Their varied backgrounds, ranging from arts education to museology and mediation, supported a dynamic exchange of perspectives and highlighted the varying levels of experience with digital tools, accessibility practices and audience engagement strategies.

The session followed a multi-step structure:

1. Introduction to the Digital Spektrum project, outlining its Erasmus+ framework, focus on adult education, and objectives regarding cultural accessibility, digital skill development and inclusive mediation for ASD and NDD audiences.

2. Expert contributions on digital transformation and accessibility, led by project partners and the Ikigaï association specialised in neurodevelopmental disorders, who provided insight into NDD characteristics, sensory and cognitive considerations, and the importance of inclusive design across museum interactions.

3. Introduction to Digital Storytelling methodology, situating Digital Storytelling within the international community of practice shaped since the late 1990s, and examining its relevance for museum contexts, particularly in supporting ASD-responsive narrative engagement.

4. Hands-on activities with a co-created pedagogical kit, jointly developed by Via Artis and Ikigaï. Participants experimented with the prototype as a means of understanding barriers faced by NDD visitors and reflecting on multisensory, narrative and material approaches to inclusive mediation.

5. Training on adapting storytelling practices, including work on narrative structuring, multimodal and visual storytelling strategies, the identification of accessible “entry points” for ASD audiences, and techniques to support emotional and sensory regulation through storytelling.

6. Presentation of evaluation and reflection tools, addressing how to assess emotional responses, empathy, accessibility considerations and overall workshop impact. Discussion highlighted the relevance of collaborative interpretation as a foundation for inclusive storytelling.

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7. Access to online modules, including the full Digital Storytelling training course, examples of museum-based Digital Storytelling activities, guidance on adapting the five-step Digital Storytelling process, resources on Digital Storytelling for ASD audiences, and links to external Open Educational Resources. Participants were also directed to the Musée de Cluny's online galleries and virtual visit, which served as preparatory material for reflective storytelling exercises.

Main results and outcomes

- **Strengthened understanding of ASD and NDD needs**: Participants developed a clearer grasp of sensory, cognitive and social dimensions shaping museum accessibility. Exposure to NDD-informed tools and specialist guidance deepened their awareness of the barriers neurodivergent visitors may encounter.

- **Adoption of digital and narrative-inclusive approaches**: The workshop illustrated how Digital Storytelling, when supported by prototypes, digital platforms and multimodal resources, can enhance visitor engagement, validate diverse interpretations and democratise access to collections.

- **Development of practical digital and mediation skills**: participants expanded their ability to use digital and material resources, including online Digital Storytelling platforms, co-created educational tools and virtual museum environments such as the Musée de Cluny's online galleries.

- **Increased readiness for inclusive design**: the training fostered a shift towards institutional and collective responsibility for accessibility, reinforcing the value of co-creation, empathetic mediation and iterative reflection among museum professionals.

Evaluation and feedback

An evaluation questionnaire was completed by all participants during the in-person session and again following the online coursework. Results show:

- High satisfaction with the workshop's relevance and pedagogical clarity, with the majority of participants agreeing that the objectives were met and that the training aligned with their professional needs.

- Consistent improvement in professional, transversal and digital skills, particularly in inclusive program design, teamwork, communication, creative thinking, and the integration of Digital Storytelling methodologies into cultural mediation.

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- Strong intention to apply the acquired methods, with many participants reporting confidence in reusing Digital Storytelling techniques and accessibility strategies in future museum practices, whether in educational programming, mediation activities or collaborative initiatives.

The positive feedback confirms that the workshop contributed substantively to the development of competencies required for inclusive cultural mediation. Participants highlighted the value of the blended format, the integration of practical experimentation with theoretical grounding, and the opportunity to reflect on accessibility through both digital tools and material prototypes. Combined with exposure to real-world museum contexts such as the Petit Palais and the Musée de Cluny, the participatory framework was regarded as essential for fostering deeper awareness, sensitivity and creative engagement in designing inclusive experiences for ASD and NDD audiences.

Digital technologies for well-being workshop - Museu Nacional d'Art de Catalunya

The workshop organised by the Museu Nacional d'Art de Catalunya (MNAC) within the framework of WP4 focused on the use of Digital Technologies for Well-being (DT for WB) in museums, specifically oriented towards the inclusion of visitors with Autism Spectrum Disorder (ASD). The main objective was to test and evaluate the prototype 'webApp *Spektrum TEA i inclusió als museus: guia per a professionals'*, a digital tool designed to support museum staff in addressing ASD-related situations through structured, role-specific scenarios.

Workshop structure and participation

The session was conducted on site and followed a structured three-part format:

1. Theoretical introduction to ASD-related accessibility challenges in museum settings, with emphasis on behavioural, sensory and cognitive aspects;

2. Live demonstration of the webApp and its scenario-based interface organised by professional roles (education, visitor services, curatorship, etc.);

3. Collaborative practical activity, where participants worked in interdisciplinary groups to analyse a fictional case and propose inclusive responses using the tool.

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The workshop brought together 60 professionals from various departments and institutions, representing a broad spectrum of Catalan museums, including education, public programmes, visitor services, curatorial, communication, exhibitions, and accessibility units. This diversity of roles enabled a broad, institution-wide reflection on inclusive practices.

Main results and outcomes

- **Strong engagement across departments**: The workshop succeeded in fostering interdisciplinary dialogue among staff who do not typically collaborate, promoting a collective understanding of accessibility and shared responsibility. The group dynamic and format facilitated open dialogue across different roles and institutions. Some commented that it was rare to have time for this kind of reflection and discussion with peers from other museums.

"*The format was very interesting. Being able to talk with other professionals about real-life cases is very helpful.*" (Participant, curatorial)

- **High perceived usability of the tool**: Participants highlighted the tool's clarity, navigability, and relevance for daily professional situations. The role-based access and concrete scenarios were seen as particularly effective in translating complex issues into actionable responses.

"*This is a very useful tool to start thinking about accessibility as a transversal issue, not just from the education department.*" (Participant, education department)
"*I really liked the case-based format. It made me think of situations we've already faced at the museum.*" (Participant, visitor services)

- **Empowerment and applied learning**: The workshop enabled participants to feel more confident in approaching ASD-related challenges. The simulated case analysis helped translate theoretical knowledge into realistic, applicable strategies. Several attendees commented that the workshop helped them rethink how they understand accessibility in their roles. Some noted they now felt more prepared to anticipate the needs of neurodivergent visitors and not only react to situations.

"*We've been working with diverse audiences for a long time, but we had never considered a specific response to ASD.* "(Participant, exhibitions team)

- **Immediate impact on practices**: Several participants expressed their intention to use the tool in upcoming activities or internal meetings, especially in the education and visitor services departments.

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- **Reflections on sustainability and implementation**: A shared insight was the need for institutional commitment to ensure long-term adoption of the tool. Participants noted the importance of internal dissemination, multilingual versions, visual summaries, printable formats, and integration into staff training programmes.

Evaluation and feedback

At the end of the session, two types of evaluation were conducted:

- An individual survey, completed by 23 participants, confirmed increased awareness of ASD, a high level of satisfaction with the tool, and a willingness to apply the knowledge gained in daily practice.

- A group-level evaluation, completed by all participating groups, provided valuable qualitative insights into the usefulness of the tool, its integration potential, and concrete suggestions for improvement.

Constructive suggestions for improvement

Participants proposed concrete additions to improve the tool:

- Visual diagrams of workflows

- Printable summary sheets

- Multilingual access (Spanish, English)

- An "emergency" quick-access mode for front-desk staff

Team Observations

- The team observed a very high level of attention, interest and participation during all phases of the session.

- Participants engaged actively with the tool and the fictional case exercise. The final group discussions were rich in insights and practical ideas.

- The tool's format stimulated realistic thinking: staff could recognise themselves in the cases and reflect on previous experiences.

- Many participants stayed after the workshop to ask for access to the tool, showing clear interest in using it in their own institutions.

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- Since the workshop, several institutions have contacted the MNAC team asking when the digital tool will be available, confirming the interest and demand generated by the session.

- There was general consensus on the need for institutional leadership to adopt inclusive digital tools beyond one-off training sessions.

The MNAC workshop clearly showed that a structured, role-specific and participatory approach to digital inclusion can generate both individual empowerment and institutional transformation. The combination of hands-on practice, peer exchange and digital experimentation proved effective in fostering awareness and capacity related to neurodiversity in museums.

2.2 Some best practice examples

Object-based learning workshop for museum professionals - University of Rome Tor Vergata

Based on the experience of the WP2 Object-Based Learning Workshop, which combined hands-on digital techniques, ASD-responsive educational strategies and collaborative design, the following best practice examples have been identified:

1. Embedding Object-Based Learning to support sensory and cognitive inclusion
The workshop demonstrated how Object-Based Learning (OBL), supported by guided facilitation, can help create meaningful learning experiences for visitors with ASD. By focusing on tactile engagement, sensory regulation and structured reflection, OBL allows visitors to connect with cultural heritage in personalised and manageable ways.

> **Why it works:**
> It transforms the museum object into a shared medium for communication and learning, lowering sensory barriers and enabling multiple modes of participation.

2. Using 3D scanning and printing to improve accessibility to museum collections
Participants learned to create and use 3D-printed replicas and digital twins of museum objects, enabling safe handling and close observation without compromising conservation requirements. These replicas proved particularly valuable for ASD audiences, who often benefit from tactile or controlled sensory interaction.

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Why it works:
It ensures equitable access to cultural content while maintaining care for original collections, and supports embodied, multi-sensory learning experiences.

3. Applying structured thinking routines to guide reflection and dialogue
The use of the "I See – I Think – I Wonder" routine helped facilitate calm, structured engagement with objects. This method provides visitors with predictable steps, reduces cognitive overload, and encourages personal meaning-making without forcing verbal participation.

Why it works:
It provides a low-pressure conversational framework that supports autonomy, emotional regulation and gradual engagement.

4. Blended learning environments to reinforce and expand practice
The workshop combined an in-presence session with continued activities on an online platform, where participants could explore virtual exhibitions, access 3D repositories and complete reflection tasks. This hybrid approach supported ongoing learning and allowed participants to test digital OBL strategies independently.

Why it works:
It sustains learning over time, encourages experimentation and accommodates different professional schedules and levels of digital familiarity.

5. Shared evaluation tools to assess well-being, empathy and inclusion
Presenting and practising with evaluation instruments (e.g., Well-being Umbrella, Empathy Scales) equipped museum professionals with concrete tools to design, monitor and refine inclusive activities. Evaluating emotional response and social engagement made the concept of "inclusion" measurable and actionable.

Why it works:
It supports evidence-based decision-making and ensures that inclusive practices are continuously improved rather than taken for granted.

Digital Storytelling Workshop for Museum Professionals – Via Artis NGA

Based on the experience of the WP3 Digital Storytelling Workshop, the following best practice examples have been identified:

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1. Co-creation of inclusive pedagogical tools
The development of the *mallette pédagogique* and related storytelling exercises enabled participants to engage with real challenges faced by ASD audiences.

> **Why it works:**
> It fosters empathy, creativity, and hands-on learning adaptable to diverse museum contexts.

2. Use of storytelling for emotional and cognitive accessibility
Narrative-based reflection allowed participants to connect personally with museum objects, making interpretation more inclusive and meaningful.

> **Why it works:**
> It bridges sensory, emotional, and intellectual engagement, supporting neurodiverse learning.

3. Hybrid learning combining digital and material tools
Blending digital storytelling platforms with sensory, object-based experiences encouraged flexible, multimodal learning.

> **Why it works:**
> It accommodates different cognitive styles and promotes both technological and interpersonal competence.

4. Collaborative, reflective pedagogy
Participants worked in multidisciplinary groups, encouraging cross-professional exchange and peer learning.

> **Why it works:**
> It nurtures community-building and shared responsibility for inclusion within museums.

5. Integration of lifelong and professional learning
The workshops' recognition through certificates validated participants' skills and reinforced inclusive education as an ongoing professional practice.

> **Why it works:**
> It embeds accessibility and inclusion into institutional learning cultures rather than treating them as add-ons.

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Digital technologies for well-being workshop - Museu Nacional d'Art de Catalunya (MNAC)

Based on the experience of the workshop led by the MNAC and the prototyping of the *Spektrum* digital tool, the following best practice examples have been identified:

1. Role-based digital guidance for inclusive action
The *Spektrum* webApp was designed to support professionals by offering customised guidance based on their functional role within the museum (e.g. education, visitor services, curatorship). This modular approach has proven effective in ensuring that inclusive strategies are relevant, accessible and directly applicable to each staff member's responsibilities.

> **Why it works:**
> It empowers professionals across departments to act autonomously while aligning with institutional values of accessibility and care.

2. Use of scenario-based training to develop empathy and reflection
The workshop incorporated realistic fictional scenarios involving visitors with ASD, which participants had to address in multidisciplinary groups using the digital tool. This method stimulated critical reflection, empathy, and collaborative problem-solving, and helped internalise inclusive responses grounded in day-to-day realities.

> **Why it works:**
> It brings abstract knowledge about ASD into tangible decision-making contexts and encourages collective accountability.

3. Inclusive design process with feedback loops
The workshop itself acted as a testing and co-design space. Participants provided concrete suggestions for improving the tool's accessibility, including the addition of visual aids, summary formats, and multilingual versions. This iterative design process reflected a user-centred methodology rooted in real institutional needs.

> **Why it works:**
> It enhances ownership of the tool and ensures that digital solutions remain flexible, evolving with the organisation.

4. Institutional cross-learning and collaboration

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By involving professionals from multiple Catalan museums, the workshop fostered peer exchange and mutual learning across institutions. This collective format made visible common challenges and opportunities in advancing accessibility and well-being through digital means.

> **Why it works:**
> It scales impact beyond one institution and encourages a shared cultural shift across the museum sector.

5. Framing digital tools as enablers of care and inclusion
Rather than positioning technology as a substitute for human work, the MNAC approach framed the *Spektrum* webApp as a supportive, reflective tool that facilitates human-centred responses. This framing helped staff understand technology as a means of amplifying inclusive values, not as a mere technical fix.

> **Why it works:**
> It supports long-term cultural change by integrating digital strategies into an ethics of care.

2.3 Recommendations

Building on the experience gained through the design, implementation and evaluation of the three workshops, the project partners have identified a set of recommendations intended to support museums and cultural institutions wishing to strengthen their inclusive and digital practices. These recommendations emerge from concrete observations made during the training activities conducted in Rome (WP2), Paris (WP3) and Barcelona (WP4), and reflect the diverse but complementary methodologies explored—Object-Based Learning, Digital Storytelling and Digital Technologies for Well-being.

Each partner contributes insights grounded in the specific focus of their workshop:

- University of Rome Tor Vergata highlights the importance of structured facilitation, the integration of digital tools in Object-Based Learning, and the use of evaluation strategies to assess well-being and inclusion.
- Via Artis NGA emphasises co-creation with specialists, narrative and multimodal pedagogies, and the need for ongoing professional development in accessibility and digital mediation.
- Museu Nacional d'Art de Catalunya (MNAC) offers recommendations on strategic, operational, pedagogical and technological dimensions, focusing on

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the institutional adoption of digital tools that foster neurodiversity-aware practices.

Together, these recommendations form a practical and forward-looking guide for museums seeking to enhance accessibility for visitors with Autism Spectrum Disorders (ASD) and neurodiverse audiences more broadly. They propose actionable steps that institutions can adapt to their own contexts, supporting long-term cultural change and the integration of digital strategies as enablers of care, empathy and inclusion.

University of Rome Tor Vergata – Recommendations for Advancing Inclusive Digital Object-Based Learning

1. Strengthen the integration of digital tools within Object-Based Learning
The workshop demonstrated that combining physical object handling with digital resources (3D scanning, 3D printing, digital microscopes, virtual replicas) enhances accessibility for ASD visitors. Museum professionals should continue adopting hybrid material–digital approaches to diversify entry points into collections.

- Incorporate 3D replicas and digital twins to support safe, multisensory exploration.
- Use mobile scanning apps and slicing tools to allow staff to independently develop accessible object kits.
- Ensure digital objects are available before and after visits to support orientation and consolidation.

2. Adopt structured facilitation strategies to support predictability and cognitive clarity
The use of structured thinking routines, such as “I See – I Think – I Wonder”, proved effective in reducing cognitive load and supporting gradual engagement.

- Prioritise clear, sequenced, and predictable workshop formats.
- Use visual prompts, step-by-step guides, and stable learning routines to support ASD learners.
- Maintain consistent sensory environments and provide alternatives for those requiring reduced stimulation.

3. Promote multidisciplinary collaboration in designing inclusive activities
The workshop confirmed that designing ASD-responsive OBL experiences benefits from a diversity of professional perspectives.

- Facilitate collaboration between educators, curators, accessibility staff, technicians and front-of-house teams.

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- Adopt co-design sessions to jointly develop object kits, digital supports and evaluation strategies.
- Encourage shared responsibility for inclusion rather than delegating it solely to education teams.

4. Invest in continuous professional development on ASD-responsive pedagogies
Participants expressed strong motivation to continue developing their knowledge of ASD learning needs and inclusive methodologies.

- Provide regular training on ASD characteristics, sensory regulation and cognitive approaches to learning.
- Offer staff development opportunities combining theory with hands-on digital practice.
- Build internal communities of practice to exchange experiences, tools and challenges.

5. Embed evaluation tools to monitor well-being, empathy and learning impact
The workshop demonstrated the value of systematic evaluation using instruments such as the Well-being Umbrella, empathy scales and emotional style questionnaires.

- Integrate evaluation tools into daily museum practice to track visitor response and staff development.
- Use data to refine workshop design, improve accessibility and support institutional learning.
- Combine self-evaluation, peer feedback and user-centred data to achieve holistic assessments.

The WP2 experience highlights that digital OBL can act as an inclusive, participatory and multisensory pathway for ASD learners, yet its success relies on institutional commitment to digital readiness, structured facilitation and ongoing professional development. When supported by collaboration and evaluation, digital OBL fosters both personal empowerment for visitors and organisational transformation for museums.

Via Artis NGA - Recommendations for Advancing Inclusion and Accessible Digital Mediation

1. Strengthen co-creation as a foundation for inclusive practice
The workshop and the development of the pedagogical prototype demonstrated that co-creation between museum professionals, NDD specialists, educators, and cultural mediators is essential for producing relevant, realistic, and sustainable tools. The

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collaboration between Via Artis, the ASD-specialist Ikigaï association and museum staff (Petit Palais, Musée de Cluny) showed that inclusive resources emerge most effectively when shaped through lived professional experience and specialist insight.

- Involve stakeholders from the early stages of tool and programme development.
- Integrate iterative co-creation sessions that allow for testing, feedback, and refinement.
- Encourage collective authorship to strengthen long-term engagement and a sense of ownership across institutions.

2. Embed awareness of NDD and ASD needs into all aspects of mediation
A core outcome of the workshop was the heightened awareness of sensory, cognitive, and emotional barriers experienced by ASD and NDD visitors. The prototype activities, sensory exploration exercises, and Ikigaï's consultations highlighted the necessity of grounding mediation in an understanding of lived neurodivergent experiences.

- Prioritise sensory accessibility, predictability and cognitive clarity in museum experiences.
- Use prototypes, tactile supports, and storytelling prompts to explore potential obstacles.
- Ensure that adaptations to specific audiences are not ancillary but central to programme design.

3. Support sustained professional development and institutional alignment
Evaluation results revealed strong participant motivation to integrate inclusive practices but also a need for continued training, institutional support and greater cross-departmental cohesion. The workshop demonstrated that accessibility cannot rest on the responsibility of educators alone: front-of-house teams, guards, curators, and managers must all contribute.

- Provide regular training on ASD/NDD, inclusive mediation and digital literacy.
- Create opportunities for interdisciplinary dialogue and shared reflection.
- Integrate accessibility objectives into institutional strategies and long-term planning.

4. Promote multimodal, narrative-based and experiential pedagogies
The Digital Storytelling methodology proved particularly effective in enabling participants to connect emotionally with collections and to validate multiple interpretations. The use of the co-created pedagogical kit, sensory museum visits, and Digital Storytelling processes showed how multimodality supports diverse cognitive styles. The preparatory exercise using the Musée de Cluny's online galleries and virtual visit also demonstrated the value of digital spaces as low-pressure environments for narrative exploration and pre-visit orientation.

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- Combine verbal, visual, tactile and digital modalities to diversify access pathways.
- Encourage personal narratives and emotional engagement with objects.
- Use structured Digital Storytelling processes to produce clarity and reduce cognitive load.

5. Develop digital resources that are intuitive, adaptable and oriented toward care

The digital components of the workshop, including the Digital Spektrum platform, online modules and Open Educational Resources ((https://learninglab.si.edu/collections/digital-spektrum-digital-storytelling-as-an-inclusive-tool-for-audience-engagement/cKVOGYSE1hHWo72D), showed that technology is most impactful when it supports empathetic mediation rather than replacing human interaction. Participants emphasised the importance of clear interfaces and adaptable content, especially in fast-paced or high-pressure museum contexts.

- Ensure tools are intuitive, easy to navigate, and usable by staff with varied digital skills.
- Present digital resources as relational supports, not prescriptive systems.
- Build flexible resources that can be adapted across different museum environments.
- Share tools openly when possible to encourage scalability and sector-wide learning.

6. Integrate systematic reflection and evaluation

The workshop's evaluation phase revealed the value of structured reflection for both staff development and prototype improvement. Participants appreciated opportunities to assess emotional engagement, accessibility challenges and pedagogical effectiveness.

- Use evaluation tools to track skill development, accessibility outcomes and visitor experience.
- Incorporate feedback from staff, NDD specialists, and, where possible, neurodivergent participants.
- Maintain iterative cycles of testing, observation and revision.

Across the workshop at the Musée du Petit Palais, the preparatory engagement with the Musée de Cluny's digital resources, and the co-creation process involving Via Artis and Ikigaï, a shared conclusion emerged: meaningful accessibility is not achieved through tools alone, but through institutional culture, collaborative practice and reflective engagement.

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Museu Nacional d'Art de Catalunya (MNAC) - Recommendations for Advancing Inclusion and Accessibility through Digital Tools

Based on the outcomes of the workshop and the testing of the Spektrum digital prototype, the MNAC proposes the following recommendations for museums aiming to advance inclusion and accessibility through digital tools. These recommendations are structured around four key levels: strategic, operational, pedagogical, and technological.

1. Strategic recommendations for institutions

- Embed inclusion as a core institutional value.
  Accessibility for neurodiverse audiences must be integrated into the museum's mission and strategic planning—not treated as an isolated initiative.
- Promote cross-departmental commitment.
  Inclusion should not rest solely with education or accessibility teams. All departments—from curatorial to visitor services—must share responsibility.
- Support long-term professional development.
  Allocate time and resources for staff training that links inclusion, digital literacy, and neurodiversity awareness.

2. Operational recommendations for programme design

- Use role-based learning approaches.
  Tools and training should reflect the specific responsibilities of staff (e.g. front of house, educators, technicians), enhancing applicability and ownership.
- Facilitate reflection through real-life cases.
  Working with realistic scenarios helps staff recognise their own practice and respond more effectively to complex situations.
- Encourage interdisciplinary dialogue.
  Internal workshops should bring together staff from different areas to foster shared understanding and institutional coherence.

3. Pedagogical recommendations for working with ASD

- Prioritise clarity, structure, and predictability.
  When designing content and experiences, ensure that information is visually accessible, clearly sequenced, and cognitively supportive.
- Offer flexible, multimodal engagement.
  Combine verbal, visual, tactile, and digital formats to accommodate diverse processing styles.
- Listen and adapt.
  Encourage active listening and co-design processes with neurodivergent audiences, creating inclusive environments that evolve over time.

4. Technological recommendations for digital tools

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- Frame technology as a support for care, not control.
  Tools like Spektrum should complement human relationships, not replace them. Digital resources must remain relational and adaptable.
- Design with usability in mind.
  Ensure tools are intuitive, easy to navigate, and usable in real-time by different profiles (e.g. visitor services staff under pressure).
- Integrate feedback loops.
  Incorporate feedback from staff and users into iterative development cycles to maintain relevance and impact.
- Promote open sharing and scalability.
  Offer tools as open resources when possible and support their adaptation across institutions.

The MNAC experience confirms that inclusive transformation requires not just digital tools, but a shared institutional commitment. When designed collaboratively and grounded in staff experience, digital strategies can become powerful instruments for care, access, and equity in museums.

Final considerations: Towards inclusive and digitally empowered museum practice

The collection of recommendations offered by the three partner institutions highlights a shared conclusion: meaningful inclusion for ASD and neurodivergent audiences requires motivated professionals, supportive institutional structures, and digital tools designed with care, clarity and adaptability. While each workshop focused on a specific methodology, the recommendations converge around several key priorities that museums can use as guiding principles for future development.

1. Embed inclusion into institutional culture
Inclusion must be integrated into mission statements, strategic planning and staff development, rather than addressed through isolated initiatives. Cross-departmental engagement is essential: accessibility cannot be sustained if it rests solely with educators or dedicated teams.

2. Prioritise structured, predictable and multisensory learning environments
Whether through Object-Based Learning, Digital Storytelling or digital well-being tools, activities for ASD audiences benefit from clear sequencing, predictable routines, and the availability of tactile, visual and digital supports that reduce sensory and cognitive overload.

3. Invest in continuous training and interdisciplinary collaboration

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Workshops underscored the need for regular professional development on ASD awareness, inclusive mediation, and digital literacy. Bringing together educators, curators, technicians, guards, public-facing staff and external specialists fosters shared responsibility and collective problem-solving.

4. Use digital technologies as relational supports
Digital resources - 3D models, storytelling platforms, role-based webApps - are most effective when used to enhance human-centred mediation. Tools should be intuitive, adaptable, and accompanied by staff training to ensure they support care rather than replacing meaningful interaction.

5. Adopt iterative design and evidence-based evaluation
Co-creation, testing and refinement strengthen both digital tools and educational practices. Integrating evaluation instruments—such as well-being measures, empathy scales, and reflective practice tools—helps institutions monitor progress and continually adapt to visitor needs.

6. Encourage openness, sharing and sector-wide learning
The workshops revealed the benefits of openly sharing prototypes, resources and methods across institutions. Museums can amplify their impact by contributing to collective knowledge-building and maintaining networks dedicated to accessibility and digital innovation.

Taken together, the recommendations from Rome, Paris and Barcelona reinforce a powerful message: digital innovation and inclusion are not parallel objectives but deeply interconnected practices that can transform museums into genuinely accessible spaces of cultural participation. By embracing structured facilitation, cross-professional collaboration, and human-centred use of technology, museums can build environments where neurodiverse audiences feel welcomed, supported and empowered.

These principles offer a practical path forward for institutions seeking to evolve their educational practices, strengthen their digital readiness, and affirm their commitment to equity and cultural well-being.

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DIGITAL-SPEKTRUM

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