

Increase of accessibility of Museum contents and meanings for persons with disabilities (PwDs) by using Digital Technologies - analysis of questionnaire results

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March 2023



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Description of the context

In the modern era, we are witness to constant changes on a global socio-economic level, followed by the progressive development of technology. To remain relevant to modern society, the museum as public and social institution, should lead the development and needs of society and, through the prism of its collection, respond accordingly. People with disabilities (PwDs) are one of the social groups that are still kept on the margins of society by stereotyped attitudes and physical barriers in public spaces. PwDs are facing several social inequalities: they are rarely museum visitors, users of additional museum programs, or users of the services of the museum staff. The digitization of museum collections can enable access to content for the general public, but that is an on-going process that has started in most of the museums in the Balkans. Together with the creation of digital technologies of an interactive nature, the digitization will contribute to a greater democratization of museum. In the processes of creating digital content and technologies, museums should also take into account the needs of different groups of PwDs, so that they too are equally included in modern cultural and social life of a community, of which technology is an integral part. Digital technologies will enable museums to present exhibits and interpret collections in different media, offering PwDs preferred ways of interacting with the contents.

In recent years, in some museums of the Balkan region, the efforts of museum experts to create digital technologies for a wider audience, taking into account the needs of PwDs, are visible. During the second half of March 2023, Balkan Museum Network (BMN) conducted a survey to determine how many members use digital technologies (DT) to increase accessibility for socially vulnerable groups of people with disabilities.

Ten member museums have filled out the online questionnaire, and these are:

1. National Institution Institute and museum Bitola
2. The Gallery of Matica Srpska
3. Museum of Vojvodina
4. National Gallery of BiH
5. National museum in Zrenjanin
6. National museum in Leskovac
7. Public Institution Museum "Battle for the Wounded on Neretva River" Jablanica
8. National Museum of Serbia
9. The Homeland Museum of Knjaževac
10. The Pavle Beljanski Memorial Collection

The museum institutions that participated in the research keep collections of the following type:

- encyclopaedic collection (7 museums)
- art collection (3 museums)

Following principles of universal design (for learning), museums can develop DT with built-in alternatives to access the same content differently. This inclusive approach to design will increase the accessibility of content to the general audience, not just the target groups for which the technology creates.

All ten museums in the research confirmed that they offer some form of DT for PwDs. Seven out of ten surveyed museums additionally clarified they developed DT for the general audience but took the needs of PwDs into account while designing and creating content.

1. Digital technologies and tools

Different digital tools that enable access to the same content in different ways will encourage interactivity of virtual manipulation of exhibits. Also, this will help increase the participation of the audience. In order for museum experts to better understand the experience of using DT that they would like to offer to the public, they need to consider several categories during inclusive design: *reach, dexterity, pace and design for play*.

The category 'reach' means that, for example, the entire display of the interactive panel in the museum space should be within reach of a person who uses a wheelchair. Museum can avoid this barrier by placing several versions of the interactive displays at different heights, which will also be accessible for wheelchair users.

'Dexterity' in this context means use of fine motor skills; e.g. there are interfaces in which the control buttons are too close to each other, thus it is hard to select an option, or the control buttons are too far apart thus require a wide range of motion. In order to avoid this, it is necessary to design buttons that will allow restarting a specific action or deleting it.

Category 'pace' refers to the time it takes for the user to understand a particular activity offered by DT. The user needs to have enough time to understand and process the content of one digital content or command to continue forward. For this reason, it is a good idea to design back or skip content buttons.

The last category is 'design for play', which is necessary for considering whether the user is required to have prior knowledge of the subject and whether the contents of the DT have a specific (educational) goal. Simple interaction with the system and viewing the results may be what the visitor needs.

Among huge varieties of digital tools for different kinds of technologies, Balkan museums offer to PwDs, mostly the following forms of DT:

- audio guides (6 museums)
- official museum websites adapted for use by different groups of PwDs (5 museums)
- forms of digital assistive technologies (5 museums)
- apps for alternative exhibit interpretation (5 museums)
- artificial intelligence (AI) systems with augmented reality (AR) elements (4 museums)
- AI systems with virtual reality (VR) elements (3 museums)
- gamification or other form of digital play & learning engaging systems (3 museums)
- sign language guides (1 museums)

The DT that the museum will offer to the public can be exclusively intended for use in the museum space or developed in an open-source system that will enable the public to access the

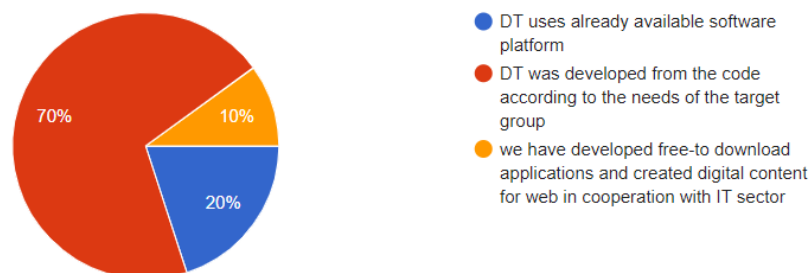
technology online and use it outside the museum space. Remote interaction with the audience with the help of DT has proven very effective in emergencies such as the global pandemic of COVID-19. When museums worldwide lost their audience in the space and the possibility of working with them directly, DT enabled access to museum contents from home. However, DTs exclusively intended for use in the museum can provide members of neglected groups of society with additional reasons to visit the museum.

In our research, **four museums confirmed that the DT is used exclusively in the museum space; while six museums answered that the created DT is used both 'on-site' and remotely.**

The majority of surveyed museums (8) confirmed that DT was developed from code according to the needs of the target group, while two museums stated that DT used already existing platforms and software such as WordPress and izi.travel.

1. Is DT at Your museum based on already existing platforms (like audio guide software), or has the museum, in cooperation with the IT sector, developed DT from code according to the needs of the target group? Copy

10 responses



Percentage of surveyed museums that developed DT from code and those that used already existing platforms

The assistive devices used the most for DTs in the examined museums are:

- smart phone/tablet devices (9 museums)
- VR/AR devices (glasses...) (2 museums)
- PC and touch screen devices (3 devices)
- hologram box (none)

2. Collaboration: IT and education sector, creative industries

During development of DT for the socially sensitive group of PwDs, the museum's multidisciplinary cooperation with the IT and rehabilitation-education sector and creative industries, is inevitable. Experts from the rehabilitation and education sector who can participate in the development of DT are **speech therapists, special education teachers, and**

special pedagogues, who, following the established needs of the PWD, will help with the reasonable adaptation of museum contents in a digital format for the target group. Cooperating with experts from the information technology sector (programmers and start-up companies), museums must communicate their vision of the functions that DT will have and for what purpose so that the wrong result does not occur.

All the museums that participated in the research confirmed that for the development of DT, they initiated interdisciplinary forms of cooperation with the following sectors and industries:

- information technology (IT) sector (8 museums)
- rehabilitation-education sector (3 museums)
- creative industries (3 museums)
- university research and development teams (1 museum)

Within the framework of cooperation with the IT sector, the museums consulted the following profiles of experts:

- IT programmers (8 museums)
- teams of university researchers (1 museum)

As part of cooperation with the rehabilitation and education sector, the museums consulted the profiles of the following experts:

- educators of the PWD association from the local museum community (4 museums)
- special pedagogues (3 museums)
- special education teachers (3 museums)
- speech therapists (none)

In the process of developing collection-based DT content, museums have hired experts from the following creative industries:

- graphic design (6 museums)
- digital illustration (6 museums)
- sound industry (4 museums)
- 3D modelling (3 museums)

3. Users: collaboration, consultation and testing

Before entering the DT development process, the museum decides for which neglected group in the society wants to increase the accessibility of contents. It is necessary to identify this group in the local museum community through cooperation with associations working to protect their rights. By establishing connections with associations, the museum will ensure collaboration with the target groups. **The collaboration should include an on-going consultative process in which the museum will identify the educational, informational, sensory, and physical needs of individuals from this group.** Defining the needs of the target group can be done with a questionnaire that will examine the level of functionality of individuals in different categories. Questionnaires can be disseminated to members of certain groups of PWDs through associations that deal with the protection of the rights of this

population or to their parents/guardians if they are persons with severe forms of intellectual impairments.

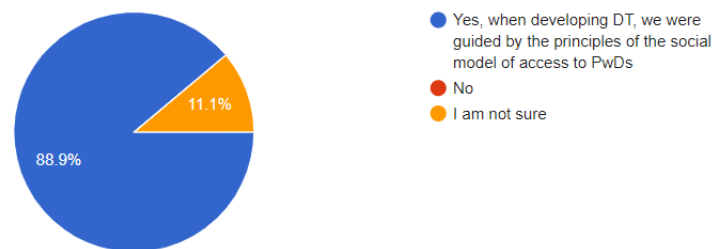
The model of approach to PwDs that BMN promotes among museums is social model of inclusion. This model recognizes that the barriers to equal participation of the disabled people are in the society, in the physical surrounding and the social attitudes, and not in the disability with whom the person lives. The implementation of this model in the museum environment through various methods¹ will contribute to the democratization of the institution and strengthen the role that the museum plays in society.

Eight out of 10 surveyed museums claimed that in developing DT and its contents, they were guided by the principles of the social model of inclusion. One respondent answered that he or she is not sure whether the development and implementation of DT were under the principles of this approach.

2. Were you guided by the principles of the social model of access to PwDs when developing DT (which in this context implies that all persons involved in the development of DT have a high level of awareness of the characteristics and needs of PwDs):



9 responses



The percentage ratio of museums that guide by the principles of the social model in the process of creating DT compared to those that were not

The target groups of people with disabilities for whom the surveyed museums have created digital technologies include:

- persons with hearing impairments (9 museums)
- persons with visual impairments (6 museums)
- elderly people 65+ (4 museums)
- different linguistic and cultural groups of migrants (3 museums)
- persons with impaired mobility (2 museums)
- persons with developmental disabilities (autistic spectrum disorder, Down Syndrome and intellectual impairments) (1 museum)

¹ These methods include *outreach* programs that are the basic model of modern museum functioning. *Outreach* programs implement for certain social groups that, for some reason, do not have access to the museum. For the museum to meet the needs of a certain group, it must first identify the members of that group in the museum's local community, examine their needs and create activities based on the collection according to the identified needs. To implement the *outreach* program, the museum goes beyond its scope to the local community and engages museum staff with exhibits outside the architectural framework of the museum.

Nine out of ten respondents confirmed that they examined the needs of their target groups before the DT development process. The museums determined their needs in the following ways:

- by disseminating a questionnaire about sensory needs and preferred learning styles among individuals with certain disabilities from the local community of the museum (5 museums)
- by disseminating of questionnaire to parents/guardians of PwDs on their sensory, educational and informational needs (2 museums)
- by disseminating of questionnaires to experts who work in associations of PwDs about sensory, educational and informational needs of their users (3 museums)
- through conversation with the representatives of the target group and their association management (2 museums)

To include groups of PwDs in the work and activities of the museum, representatives of the target group must be involved in the process of developing DT and creating content. Reflecting the differences in the society through their work and by giving a voice to neglected groups, museums will initiate democratization processes and take on a more significant role in society.

Out of the total number of respondents, two museums confirmed that representatives of the target group were not involved in technology development and content creation.

The other eight museums, which answered in the affirmative, included representatives of the target groups in the process of developing DT and creating content in the following ways:

- groups of PwDs were involved in pre-testing phase (5 museums)
- representatives of persons with developmental disabilities verified the easy-to-read language (4 museums)
- representatives of PwDs selected exhibits for DT content (2 museums)
- PwDs are the authors of interpretations of digital exhibitis (1 museum)

In the final stage of technology and content development, museums need to test the technical feasibility and content of DT before releasing the technology to the general public. This phase **should be carried out in cooperation with PwD focus groups in the museum area**. This way museum will correct any technical deficiencies and see how users react to the content. If the DT is intended to use from home, this is even more important because, the museum will see how users connect with the actual exhibits presented in the DT.

Eight out of ten surveyed museums confirmed that they tested the developed DT with control groups of respondents in the following way:

- by organizing activities for the control groups of respondents in the museum (7 museums)
- by observing the use of DT by the end users in the museum space (6 museums)
- by collecting digital feedback on the experience of using DT at home from end-users or parents/caregivers of persons with developmental disabilities (1 museum)

All surveyed museums confirmed that they promoted DT in associations that deal with the protection of the rights of PWDs in the local community. Eight out of ten museums confirmed that they continuously conduct additional activities for the target groups of PwDs with DT in the museum space.

4. DT multimedia content based on collections

Using digital technologies, the collection and information about it presents to museum users/visitors through multimedia content. Depending on the needs of the target group for which DT is being designed, the museum, in cooperation with creative industries, will create visual, audio, and textual content about museum objects written in easy-to-understand language. Considering the great possibilities offered by DT, it is always better to create interactive content that will contribute to user participation. In the segment of creating DT content intended for PWDs, **it is essential to use game design. With the help of this category of universal design (for learning), the museum DT will not require the user to have prior knowledge about the presented exhibit. Simple interaction with the system and viewing the results may be what the user needs.**

Given the majority representation of museums with an encyclopaedic type of collection in the research, the museums based the contents of the DT on various museum exhibits, namely:

- exhibits of the historical collection (documents, objects etc.) (3 museums)
- exhibits of the art collection (paintings, sculptures, drawings) (6 museums)
- exhibits of the archaeological collection (artefacts, numismatics etc.) (4 museums)
- exhibits of the natural collection (specimens of flora and fauna) (1 museum)
- exhibits of the ethnographic collection (tools, costumes etc.) (3 museums)

According to the needs of the PwD group for which DT intends, the museum presents contents based on the collection through various media. If the museum offers more than one medium through DT, users with different forms of disability will choose the medium that best suits their needs.

The surveyed museums presented the contents of the collection to the target groups through the following media:

- sound (7 museums)
- video (7 museums)
- textual content in easy-to-read standard (9 museums)
- animation (4 museums)
- 3D visualisation (2 museums)
- augmented reality (4 museums)
- virtual reality (3 museums)

All the surveyed museums confirmed that the multimedia contents of DT, which are based on the exhibits of the museum collection, are accompanied by information about the objects in the following way:

- by implementing easy-to-read standards (7 museums)

- by using the appropriate font, contrast and font size (5 museums)
- by using other digital interactive tools (5 museums)
- by using text-to-speech software (2 museums)

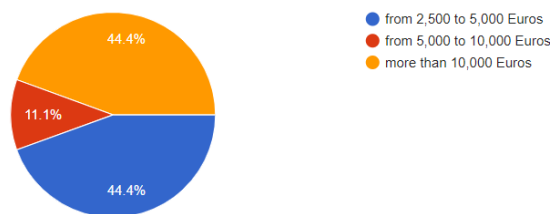
5. Finance: investors and costs

The majority of surveyed museums (8) stated that the development of DT and contents are financed by the national, regional, or international European grants. Three museums stated that the institution partially co-financed the development of technologies through the income generated from tickets sale, souvenirs, museum publications, etc.

2. Approximately how much money did the museum spend on the development and implementation of DT and its contents:



9 responses



Overview of the museum's financial expenditure for the development of DT and content

For DT development and content creation, the museums that participated in the research temporarily hired external professional associates from the IT sector, the rehabilitation-education sector, and creative industries in the following number:

- more than 10 external experts (1 museum)
- 10 external experts (2 museums)
- 5 external experts (1 museum)
- 4 external experts (2 museums)
- 3 external experts (2 museums)
- the museum did not need to employ external experts for these purposes (1 museum)

During the conducted research, we wanted to examine whether museum experts who participated in the development of DT disseminate their practices through scientific and research work, participation in regional and international conferences, etc. Given that the main goal of BMN is to connect experts and museums, we believe that it is important that positive museum practices in the field of PWD digital accessibility shares among museum professionals. More than half of the respondents (6) answered in the affirmative and mentioned the following conferences and platforms where they shared their experience in working with DT and PWD:

- International Conference "Culture of Diversity: Underrepresented and Vulnerable Groups in Culturally Diverse Space" organized by the Typhological Museum in Zagreb

- Publications of national committees of the International Council of Museums (ICOM)
- Online articles of the ICOM platform for sharing experiences among museum experts in the magazine "ICOM Voices"
- "Balkan Museums Without Barriers" regional seminars organized by BMN

SAMLE QUESTIONNAIRE

General information

E-mail address:

Name of the Museum institution:

Your position at the museum:

A) Digital technologies (DT)

To simplify the questionnaire, the concept of **Information Technology (IT)**, which includes the development, research, use, design, and management of information systems, in the questionnaire we will name **Digital Technologies (DT)** as a set of tools and techniques based on a binary system to facilitate the daily life of man.

While all those devices that are designed, made or facilitated to assist a person in performing a task we call **(Digital) Assistive Technologies (AT)**. AT products can be purpose-built for people with disabilities (PwDs in further text) or be widely used.

You can select one or multiple answers where applicable.

1. To increase the accessibility of the content and meaning of the collection for people with disabilities, the museum offers some form of digital technologies:

YES NO

2. If you answered 'YES' to the previous question, please indicate/write down which form of DT the museum offers to the group of PwDs:

- a) audio guide
- b) digital application for alternative interpretations of exhibits
- c) Augmented reality digital tool based on the collection
- d) Virtual reality digital tool based on the collection
- e) the museum adapted the existing official website according to the principles of universal design and *easy-to-read* standards to achieve equal access to digital contents
- f) some form of digital assistive technology
- g) gamification or other form of digital playing & learning engaging system
- h) other: _____

3. The technology developed by the museum to increase the accessibility of the content for PwDs uses the following digital tools and multimedia content:

- a) animation
- b) sound
- c) video
- d) textual content in easy-to-read standard
- e) 3D visualization
- f) augmented reality
- g) virtual reality

- h) video game
- i) hologram
- j) other: _____

4. The DT developed by the museum for PwDs is used in which environment:

- a) 'on site' (in the exhibition context of the museum)
- b) remote (at home)
- c) both

5. In what format or AT device can DT developed by museum, can be used:

- a) smart phone/tablet devices
- b) PC's and touch screen devices
- c) VR/AR devices (glasses, etc.)
- d) hologram box
- e) other

6. DT and its contents are tested on target groups in a museum or online environment:

YES NO

7. If you answered 'YES' to the previous question, please indicate/write down how was the DT tested:

- a) control groups of respondents at organized activities in the museum
- b) the use of DT by end users observes in the museum space
- c) collected digital feedback on the experience of using technology at home from end-users or parents/guardians of people with developmental disabilities
- d) other: _____

B) Collaboration: target groups of persons with disabilities

1. The museum has developed DT for groups of people in the following states of disabilities:

- a) visual impairments
- b) hearing impairments
- c) persons with developmental disabilities (Autistic spectrum disorder, Down Syndrome, intellectual impairments)
- d) elderly people (65+)
- e) different linguistic and cultural groups of migrants
- f) people with impaired mobility
- g) other: _____

2. Were you guided by the principles of the social model of access to PwDs when developing DT (which in this context implies that all persons involved in the development of DT have a high level of awareness of the characteristics and needs of PwDs):

- a) Yes, when developing DT, we were guided by the principles of the social model of access to people with disabilities
- b) No

c) I am not sure

3. Before you started developing DT, You considered the needs of your target group?

YES NO

4. If you answered 'YES' to the previous question, please indicate/write down how You identified the needs of the target group:

a) by disseminating a questionnaire about sensory needs and preferred learning styles among individuals with certain disabilities from the local community of the museum

b) by dissemination of questionnaires to parents/guardians of PwDs on their sensory, educational, and informational needs

c) by dissemination of questionnaires to experts who work in associations of PwDs about sensory, educational, and informational needs of their users

d) other: _____

5. In the process of creating digital technology content, you consulted representatives of groups of PwDs:

YES NO

6. If you answered 'YES' to the previous question, please indicate/write down how the consultation process was carried out:

a) representatives of the target groups of people with disabilities selected exhibits for digital technology content

b) people with disabilities are the authors of interpretations of digital exhibits

c) representatives of persons with developmental disabilities verified the easy-to-read language of the textual contents

d) representative of PwDs were involved in pre-testing phase

e) other: _____

C) Collaboration: education and IT sector, creative industries

1. Is DT at Your museum based on already existing platforms (like audio guide software), or has the museum, in cooperation with the IT sector, developed DT from code according to the needs of the target group?

a) DT uses already available software platform

b) DT was developed from the code according to the needs of the target group

2. If you answered the previous question under a), please write down on which software platform the DT works:

3. If the museum developed DT from the code, what forms of cooperation did it have to initiate?

a) collaboration with IT sector

b) collaboration with education sector

c) collaboration with creative industries

d) university researchers and development teams

e) other: _____

4. If the museum hired experts from the educational rehabilitation sector, indicate the profiles of these experts:

- a) educators from the association of persons with disabilities from the local community of the museum
- b) special pedagogues
- c) speech therapist
- d) defectologist
- e) other: _____

5. If the museum hired experts from the IT sector, indicate the profiles of these experts:

- a) IT programmers
- b) start-up companies
- c) university research teams
- d) other: _____

6. In the process of creating content for DT, the museum engaged experts from which creative industries:

- a) graphic design
- b) digital illustration
- c) sound industry
- d) 3D modelling
- e) other: _____

D) Contents based on collection

1. Exhibits of which type of museum collection has undergone reasoned adaptation for greater digital access:

- a) exhibits of the historical collection (documents, objects)
- b) exhibits of the natural collection (specimens of flora and fauna)
- c) exhibits of the art collection (paintings, sculptures, photographs)
- d) exhibits of the ethnographic collection (costumes, tools and ethnographic objects)
- e) exhibits of the archaeological collection (artefacts, numismatics etc.)
- f) other: _____

2. In addition to the digital form of museum exhibits, does the technology also offer data about them?

YES NO

3. If you answered 'YES' to the previous question, please indicate/write down how the data on museum exhibits are adapted for greater accessibility to PwDs:

- a) by implementing *easy-to-read* standards
- b) by using *text-to-speech* software
- c) by using the appropriate font, contrast, and font size
- d) by using other digital interactive tools

E) Financing: investors and costs

1. From which sources the museum financed the development of DT and its contents:

- a) museum's financial resources (earnings from tickets, souvenirs, and museum publications)
- b) sponsored by companies from the public and private sector
- c) the museum received a financial grant from a (international) foundation, association, or ministry of culture for the project idea of developing and implementing DT
- d) other: _____

2. Approximately how much money did the museum spend on the development and implementation of DT and its contents:

- a) from 2,500 to 5,000 euros
- b) from 5,000 to 10,000 euros
- c) more than 10,000 euros

3. During the process of development and implementation of DT and its contents, the museum temporarily had to employ how many external experts?

F) Reaching the target groups with your digital technology

1. The DT offered by the museum is available for free online download to end-users:

YES NO

2. If you answered 'YES' to the previous question, please indicate for which smartphone/tablet operating systems the DT intends for:

- a) Android
- b) IOS
- c) other: _____

3. Have you promoted DT in associations of PwDs in the local museum community?

YES NO

4. Does the museum organize additional activities for groups of PwDs with the use of DT in the museum space?

YES NO

5. Museum experts write articles and present scientific papers on DT as tools for enabling greater accessibility:

YES NO

6. If you answered 'YES' to the previous question, please write down the name of the magazines and conferences where DT from your museum was presented to wider professional public: