



Accessibility of Virtual Museum Spaces in the 21st Century in Turkey

Cemre Kılınç* 
Osman Tatal** 

Abstract

Museums, which are the embodiment of art, exhibition, culture, and science, have started to offer virtual space experiences as well as traditional physical space experiences in recent years. In addition to the development of technology, the pandemic, which started in 2019 and affected the whole world, has also been effective in accelerating the transformation of museums from physical space to virtual space. The increasing use of virtual museums directly concerns different user groups in terms of accessibility. In a physical museum experience, solutions that appeal to different types of users are generally produced. Thanks to these solutions, an individual with any disability can be included in the space with all senses such as sight, touch, smell, and hearing during a museum visit, while the lack of inclusion of all senses in the virtual space experience causes the experience to be more limited. This study discusses this limitation in terms of accessibility. How can the virtual space experience be more accessible for different types of users? Can different solutions be offered to all user groups for a better understanding of the space and the art product? These questions constitute the research questions of this study. In this context, this study aims to examine how accessible virtual museums are. The study has conducted this inquiry through 59 virtual museums in Turkey. As a method, virtual museums were classified and tabulated in terms of their accessibility levels in line with their characteristics. It was concluded that there are deficiencies in the experience of different types of users and various suggestions were made in terms of virtual accessibility.

Keywords:

Accessibility, museum, universal design, physical space, virtual design

*Bingol University, Department of Architecture, Bingol, Türkiye. (Corresponding author)
✉ Email: ckilinc@bingol.edu.tr

**Eskisehir Technical University, Faculty of Architecture and Design, Eskisehir, Türkiye.
✉ Email: otatal@eskisehir.edu.tr

INTRODUCTION

Design can be defined as the process of knowledge acquisition, shaping, constructing, and envisioning or producing something in mind (Hardt, 2006; Evcil, 2014). Design can be accessible if it meets the vital needs of individuals. Therefore, making a design accessible requires not only making it accessible through adaptations for those in need but also focusing on its accessibility for all human situations and user states (Tural, 2012).

When an analysis is made from the recent past to the present, it is seen that despite the design approaches that try to be inclusive today, the common design approach is shaped according to the average user group, and solutions to ensure accessibility in terms of design are provided by special designs or are generally adapted to the existing design. However, putting the human at the center of design keeps the approaches of being inclusive, being for everyone, or being universal on the agenda of the design field as indispensable for a sustainable urban life since the last quarter of the 20th century like environmental values. These approaches elevate “accessibility,” a prerequisite for independent living and full participation in life, as a way to guarantee the active participation of every individual in society, into one of the indispensable themes of the agenda in the literature on international human rights (Chan & Zoellick, 2011). More accessible, inclusive environments for user groups are being considered and efforts are made by different disciplines to produce experimental solutions. (Iwarsson & Stahl, 2003) (Acırlı & Kandemir, 2021).

Accessibility-based approaches arising from the disability rights movement after the Second World War are inclusive for everyone or universal approaches, also launched by different names like ‘Life Span Design’, ‘Transgenerational Design’, ‘Aged Friendly Design’, and ‘Design for the no-So Average’ (Chan, Lee, & Chan, 2009) (Herwig, 2008) (Theil, etc. al., 2022) (Arning & Ziefle, 2007) (Handler, 2018). These accessibility-based design approaches, which often have the same goal in mind, are commonly based on the characteristics like equality, inclusiveness, sensibility/sensitivity, appropriateness, realism, respect for user diversity, healthfulness, functionality, perceptibility, sustainability, availability, simplicity, intuitional and easy usability, safe and risk-free, tolerance of usage errors, ergonomics, and suitability for use (Persson, etc. al., 2015). They are characterized as being ergonomic, suitable for use, and able to tolerate usage errors. Undoubtedly, behind this diversity, which is similar to each other the responsibilities of countries arising from international agreements, national and international policies, and the social, cultural, and economic differences between countries in their approach to the subject play an important role (Tural, 2018).

Accessibility, as one of the areas of human rights that is as problematic as discrimination and even includes discrimination, has recently gained a rightful place in international arenas. (United Nations

Human Rights, 2009). Accessibility, besides being a means of exercising rights for the disabled, is also a condition for living independently and fully participating in all areas of social life. (Çağlar, 2012). The accessible design has often focused on the accessibility of space, addressing the issue through ramps, elevators, toilets, and sometimes parking lots, and even focusing on wheelchair users, rather than providing accessibility for everyone, anytime and anywhere. Apart from a limited number of applications for full participation in daily life, regulations for the visually impaired have been included in the area of accessibility with widely tangible walking surfaces and provision of explanations in Braille, while regulations for the hearing impaired are generally included in the area of accessibility with induction loop systems (Ministry of Family, Labor and Social Services of the Republic of Turkey, 2021). Regulations for other areas of daily life such as transportation, information, or accessibility of services have also remained far from the discussion in this environment where multiple disabilities, children, or the elderly are almost never taken into account and even the accessibility of space is inadequate. Aspects like creating barriers through design instead of making it accessible, weakening comfort and quality of life, and even making the average user group the target audience of the design have caused disabilities in the participation of the users of the design in daily life (Tutal, 2018). While, on the one hand, the process of putting barriers through design continues, on the other hand, inclusive or universal design for all has become a design culture, aiming to reach situations where not a single user is left at a disadvantage while seeking answers to the ever-changing needs of society. In particular, the widespread use of the concept of accessibility and its emergence on the agenda in this process has made it an inclusive and effective component for everyone under the roof of universal design.

In seeking to improve quality of life, accessibility is a fundamental right as it is a means of enabling everyone to participate in daily life at all times and in all places, uninterruptedly and independently, and a basic condition for full participation in all areas of social life (Tutal, 2015). This right has been also supported by the UN Convention on the Rights of Persons with Disabilities, the most important international document in recent years, and has been recognized as one of the eight fundamental principles of the convention. The measures taken by the signatory countries are set out in Article 9.

“...To enable persons with disabilities to live independently and participate fully in all aspects of life, states parties shall take appropriate measures to ensure persons with disabilities have access, on an equal basis with others, to the physical environment, transportation, information, and communications, including information and communications technologies and systems, and other facilities and services open or provided to the public, both in urban and in rural areas.

These measures shall include the identification and elimination of obstacles and barriers to accessibility.”, shall apply to, inter alia:

9/1(a) Buildings, roads, transportation, and other indoor and outdoor facilities, including schools, housing, medical facilities, and workplaces.

9/1(b) Information, communications, and other services, including electronic services and emergency services (United Nations Human Rights, 2009).

The Convention includes the ability for Living Independently and Being Included in the Community (Article 19/c), Freedom of Expression and Opinion, Access to Information (Article 21/a, c, d), and Participation in Cultural Life (Article 30), which aim to ensure virtual accessibility, which is the subject of this research. In addition, Articles 1, 2, 3, 4, 5, and 6 give responsibilities to States Parties. These responsibilities are included in Articles 19 and 21 of the convention.

19/(c) Community services and facilities for the general population are available on an equal basis to persons with disabilities and respond to their needs.

21/(a) Providing information for the public in accessible formats and technologies appropriate to different kinds of disabilities promptly and at no additional cost to persons with disabilities,

21/(c) Encourage private organizations providing services to the public, including the Internet, to provide information and services in formats accessible and usable for persons with disabilities,

21/(d) Encourage the mass media, including those providing information over the internet, to make their services accessible to persons with disabilities, and

Provisions relevant to the subject of this study are included in Article 30 of the Convention on Participation in Cultural Life, Recreation, Leisure, and Sports. According to Article 30, States Parties recognize the right of persons with disabilities to participate in life on an equal basis with other individuals without disabilities and, in this context, are obliged to take the necessary measures to ensure that persons with disabilities have access to cultural materials and activities in practicable forms. They are also obliged to provide access to places where cultural activities take place or services are provided, such as theaters, museums, cinemas, libraries, and touristic services. They will take measures to ensure that persons with disabilities have the opportunity to develop and use their creative, artistic, and intellectual capacities, not only for their own benefit but also to enrich society for all. States Parties are obliged to take all necessary measures to ensure that laws protecting intellectual property rights do not constitute an inappropriate or discriminatory barrier to the access to cultural materials by persons with disabilities and to do so by international law (United Nations Human Rights, 2009).

This study focuses on the virtual accessibility of museums in the wake of COVID-19, the effects of which are still ongoing. Focusing on 59

virtual museums in Turkey, the study discusses the accessibility issue in the virtual environment due to the restrictions imposed on the use of public spaces due to the COVID-19 pandemic. In this context, a qualitative research method was used in the present study, and a case study was carried out to analyze and interpret the museums holistically within their own borders. As identified by the General Directorate of Cultural Heritage and Museums and the Culture and Tourism Association, 59 museums, providing virtual museum services as indoor spaces, of the 80 museums providing virtual museum services, including open museum spaces such as ancient cities, ruins, and ancient theaters, were included in this study.

EXHIBITION SPACES, INTERACTION, AND MUSEUMS

The aim of art is for every audience to be able to make sense of the artist's free composition by organizing a series of communication effects (Eco, 2001). Art, which is a phenomenon based on the audience's relationship with the product, is located in spaces accessible to users according to accessibility criteria and is open to interaction by appealing to all segments of society without discrimination (Lacy, 1995; Ercan, 2013).

As a result of technological developments, the venues where artworks are exhibited are becoming more diverse. Different exhibition venues change the audience's interpretation of the artwork, giving a new meaning to the art experience.

Among these venues, museums are the most important places of experience with their functions of preservation (storage, conservation, restoration, etc.), research (scientific and academic studies, literature, etc.), and communication (exhibition, education, integration with different functions, etc.). While a traditional museum experience is based on a viewing experience limited to the spaces where artworks are exhibited, it has evolved into a new dimension where different presentations and interactions are provided. As a result, museums are rapidly becoming less collection-centered and more community-centered, with a greater emphasis on communication beyond the walls. This makes museums more attractive by extending classical communication and lived experience beyond just physical visits, both turning visitors into users and diversifying participatory experiences (Vermeeren et al., 2018). Thus, instead of hosting a hierarchical and historical exhibition as in classical museology, museums have started to offer environments where communication is at the highest level, not only learning and recognition but also participation-priority experiences, and thereby, museums have turned into visitor/user-oriented living spaces rather than collection-oriented.

Physical Exhibition Spaces, Interaction, and Museums

People participate in an interactive experience when they are physically present in a space and take part in it. Public open spaces such as squares, streets, avenues, outdoor spaces, indoor spaces, and physical

environments such as museums, galleries, and auction venues host this exhibition and the art exhibited is in physical interaction with the user/audience. However, artworks can be sometimes displayed without spatial boundaries, as in the cases of the Berlin Wall (Figure 1a), the graffiti on the John Lennon Wall in Prague (Figure 1b), or the seesaw installation on the Mexican American border wall (Figure 1c), or one can go beyond seeing and interact with an installation (touching, entering, climbing, etc.) (Figures 2a-c). Sometimes, as in the installations “Onde Pixel” (as shown in Figure 3a-b) in Milan and “The Pool” in Lisbon, it can turn into an experience that includes both seeing and hearing through light-color-sound interaction in an enclosed space (as indicated in Figure 3c). Although the places where art is experienced and visitors can access and interact with the artworks vary, such as galleries, exhibition halls, museums, etc., museums have an inclusive content of other places in terms of their history (Aslanoğlu, 2014). It is a common assertion that the practice of architecture is perceived mainly through the sense of sight and therefore tends to neglect the senses of hearing, smell, touch, and taste. On the other hand, the process of perceiving space is not only related to our visual perceptions and their impact on the human visual cortex but also through sound, sensation, and smell. Therefore, while the eye/sight has traditionally dominated the architectural design process, an increasing number of architects and designers, especially in recent years, have focused on the role played by other senses like sound, touch, and smell.



Figure 1. Examples of art and interaction in physical space - unenclosed spaces: (a) Berlin Wall, (b) John Lennon Wall, (c) Mexican American Border Wall ([http #1](#) - [http #2](#) - [http #3](#))

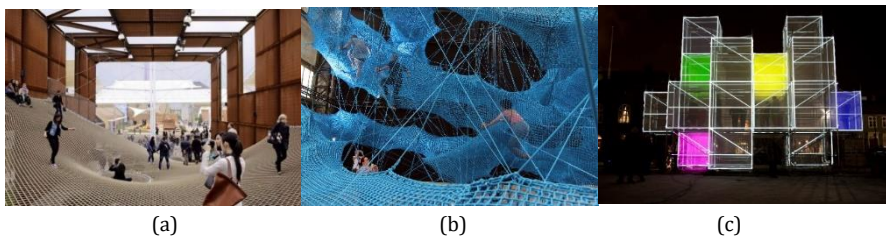


Figure 2. Examples of art and interaction in physical space - Touch-enter-climb installations: ([http #4](#) - [http #5](#) - [http #6](#))

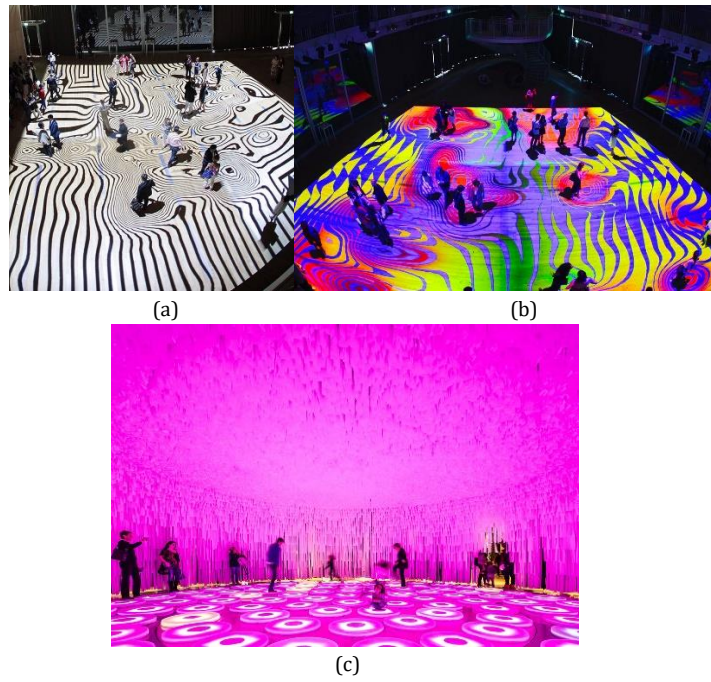


Figure 3. Examples of art and interaction in physical space - light-color-sound interactive artworks: (a-b) Ondes et Pixels installation, (c) The Pool installation ([#7">http #7](http) - [#8">http #8](http))

The museum's contact with the space-art-individual creates an intangible concept of 'interaction' and ensures that art is understood in its own place and context. One of the most important factors in providing such an understanding is the interaction with the senses. The senses are specialized forms of skin tissue that allow us to make contact with the outside world (Pallasmaa, 2011). According to Montagu (1986), touch is our first means of communication, our oldest and most sensitive sense. Touch provides a better perception of space by integrating physical experience with visual perceptions. Here, the sense of touch should not be considered directly touching an artwork. Being physically present in a museum space, smelling it, seeing it from every angle, and experiencing it may also mean touching it. This is because all senses, including sight, are extensions of the sense of touch (Pallasmaa, 2011). Therefore, physical interaction with the museum space is achieved by touching it with the cooperation of other senses, especially touching. In this context, this is one of the reasons why museums exist in their traditional physical forms.

The physical experience of a museum takes place in its walkable or visitable spaces. Spaces are perceived not only from certain viewing angles but also from all aspects that an individual wants to experience. The experience during the visit can take place on a specific route depending on the type of exhibition, or it can naturally take place, without any limitation between the visitor and the artwork. The interaction between the visitor and the artwork is realized through the way the work is presented in the place where it is located. In this interaction, although it is not always possible to touch the artworks in the space, perceiving the designs with other senses creates a physical experience. The physical context in which the museum is located, the sounds in this context, the angle of the sunlight coming into the space,

the sound of rain, and atmospheric effects such as watching the snow slowly drifting through the opening of a space, or the time of visit (day and night) can cause the individuals to have different experiences in the same space at different times (see **Figure 4**).

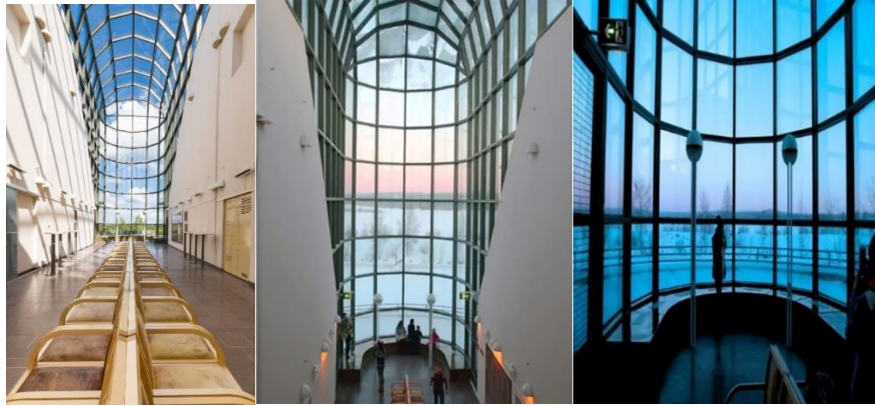


Figure 4. Different weather conditions give physically different experiences to the individual in the same museum space, Arktikum Museum - Finland ([#9](http))

In addition to the exhibitions where the individual physically interacts with the artworks, some museums allow these exhibitions to be visited in virtual spaces. It is debatable how effective virtual museums are at creating the sensory experience of one-to-one artworks in physical space. It is controversial how effective virtual museums are in creating a sensory experience with one-to-one artwork in a physical space. Therefore, it is not possible for the depictions of artworks in virtual space to exactly replace their depictions in physical space.

Virtual Exhibition Spaces, Interaction, and Museums

Virtual space is a mirror image of physical space. While the harmonic coexistence of the two spaces continues, virtual space is independent of rational conditions such as context and geography (Kerckhove, 2001). Today, museums are one of the sectors that have started to be effective in the use of virtual space. It is possible to create virtual collections where the collection information is stored and preserved virtually, where both the formal and content information of objects are created and recorded, and where any kind of access is possible. The technology-art interaction in these museums transforms museums into an environment where art and technology come together, as technology becomes a part of the museum as well as art (Yılmaz, 2020). In this environment, the dichotomy between authentic (real museum objects) and fake (virtual objects) and virtual activities are discussed by many museum researchers in terms of the real experience versus the virtual experience. While Splidoro (Billock, 2020) considers it a great loss not to have the real experience of seeing an artwork in a physical space, which turns museums into storage areas, Vajda (2020) emphasizes that the “spirit of the place” in real museum spaces cannot be represented in a virtual copy and this spirit cannot be the same in a virtual environment. Govan (Billock, 2020), on the other hand, emphasizes that having everything completely online may be incomplete in terms of virtual accessibility and that the design and spatial use of museums

should be transformed by introducing a hybrid solution. On the other hand, the virtualization of museum interiors and exhibitions can be described as a milestone in the elimination/fragmentation of the traditional, and new museum forms welcome visitors with names such as the digital museum, online museum, electronic museum, virtual museum, web museum, which are also used in this article (Holdgaard, 2021).

Around the world, museums and their activities at all levels have been severely affected by the pandemic, and strict hygiene protocols to keep both visitors and staff safe have reduced visitor/user numbers and made alternative forms of museums more attractive. According to a study by the European Network of Museum Organizations on the impact of the COVID-19 pandemic on museums in Europe, over 70% of these museums remained closed to the public for the duration of the study without a firm reopening date, and even a second mandatory closure of museums was decided without consultation despite existing and well-functioning hygiene protocols. However, the study also emphasized that the closure decision was not influenced by the fact that no cases of COVID-19 contamination were recorded among the visitors to the museums in Europe in the post-pandemic period. According to the study, museums lose 25-75% or even more visitors upon reopening after their first closure, and the main reasons for this dramatic decline include the decrease in the global tourism movement (73%), the termination of both school programs (64%) and social aid and society programs (50%), and increased security protocols that generally allow limited numbers of visitors (Network of European Museum of the Organisation, 2021).

Despite such unprecedented impacts of COVID-19, museums have been quick to react to the pandemic and have begun to implement creative solutions to reach their audiences. In this regard, the Virtual Public Square, focusing on disseminating information specific to cultural programming, human rights, and communication techniques, is a communication platform created for this purpose. It also aimed to lay the groundwork for actions related to COVID-19 and create a platform for members to come together and share their experiences ([http10](http://10)). Moreover, many museums, which could be visited virtually even before the pandemic, have increased the number of such 'museums without walls' (Vajda, 2020) by developing and opening their virtual events during the stay-at-home periods. Museums, diversifying their virtual art tours in line with the transformations they have experienced, have helped to reduce isolation and loneliness through virtual services by giving remote access to people staying at home. They also continued their extensive educational role remotely, providing quizzes, games, and educational materials alongside online exhibitions. The museums' starting to provide online services and the increase in their existing online services were also reflected in the research conducted by the European Museum Organizations Network. It was reported that online

services increased by 93% and museum social media activities by 75%. According to the research, 53% of museums either started creating video content or increased their video content (Network of European Museum Organization, 2021).

Undoubtedly, social media has played a major role in increasing the rate of participation in events in this process (ICOM, 2020; Interreg Europe, 2020). Therefore, new museum forms, online services, social media activities, virtual exhibitions, etc. created in an effort to increase the number of visitors along with the content, have begun to change the spatial perceptions of the visitors, leading to the transformation of the experience of interacting with exhibitions and artworks in museums. During the COVID-19 pandemic, while the great disconnect with physical space, albeit not permanent, caused a lack of cultural, contextual features and spirit of the place, the increasing presence of virtual tours and the opening of a museum online in any country in the world has become inclusive for every individual who cannot physically access that place.

Universal Accessibility of Interactive Art in Virtual Museum Environments in the COVID-19 Period

The COVID-19 pandemic started in 2019 has negatively affected many areas from education to transportation, from production to consumption, and from economy to tourism, together with the field of health. The new normalization seen in many places in daily life has also affected cultural participation, starting to change the way art spaces such as museums are experienced through physical interaction. The act of touch, which gained an unsettling characteristic with the pandemic, led to the closure of museums as physical spaces, which are generally not considered mandatory in daily life. This situation has already begun to change the role of culture and museums in our society. Restrictions on social distance, like many other institutions around the world, have raised the question of how to redefine ties to art and culture (Merritt, 2020; Tallant, 2020).

In this unnatural period for museums, communication and interaction with artworks became less physical and more virtual. Making physical spaces inaccessible, eliminating museum-hosted events, organizing new exhibitions, and attempting to contextualize them virtually can be considered a different and unusual form. While this situation led to a change in quantitative and qualitative expressions, boundaries disappeared for the exhibition area and exhibition halls expanding in the space, and the space now started to consist of 'homepages' (Vajda, 2020).

RESULTS

Cultural spaces have a responsibility to welcome everyone inclusively as a service to the public. Although access to cultural heritage has been declared as an official right, this idea is still not fully mature

worldwide. (Partarakis, et al. 2016). Each user gets a unique experience in the online virtual art process. The range of possible inclusiveness of activities is directly related to how effectively websites build their designs considering various user groups.

Under normal circumstances, user groups can be more easily guided spatially using methods such as material differences on the floor, signage, embossed Braille, and voice guidance systems in the name of inclusiveness and accessibility in a physical museum visit (Kiessner, 2020). In addition, activities such as attending or participating in interactive exhibitions and learning during physical museum visits also provide users with a variety of experiences. The existence of solutions that appeal to different user groups in the virtual process is controversial. In virtual museums, it is important to easily include different user groups in the web environment, as in the physical museum experience, and to provide accessible processes in the physical experience. Having options for hearing-impaired user groups such as written information elements/buttons/mouse gestures, guiding signs/shapes, information texts, and sign language translators will make a museum's web page easily accessible for such user groups. Likewise, the web pages of virtual museums must produce solutions for another special user group, the visually impaired. To make screen notifications more accessible to this user group, the necessary software and hardware should be developed to enable collaborative integration. Another important feature is depictions and/or representations of space and artworks. An important detail in these explanations is the automatic addition of alternative text to the database from which the content is generated (EGED, 2020).

To the best of the researcher's knowledge, when compared to the increased activity and use of social media on the online web pages of museums around the world after the COVID-19 pandemic, no such information has been found on the web pages of museums in Turkey. Accordingly, this study discusses the accessibility of virtual museums in Turkey for different user groups. According to the data from the Culture and Tourism Association and the General Directorate of Cultural Heritage and Museums, 59 museums across Turkey, excluding open-air museums, ruins, and ancient theaters, offer virtual tours to web users (http11, http12). The accessibility levels in the museums examined within the scope of the research are classified in Table 1 according to the presence of the following features that can enable the user to better perceive the space and artworks:

- Architectural plans
- Axonometric view
- Information buttons
- Action buttons
- 360o space experience
- Visual support
- Auditory support

- Video support
- Ability to measure the dimensions of space and artwork.

Table.1 Accessibility-based classification of virtual museums in Turkey (the name given in the parenthesis at the end of each museum's name is the city name in which the museum is settled)

	Museums	Architectural plan	Axonometric view	Information buttons	Action buttons	360° space experience	Visual support	Auditory support	Video support	Measure size
		A	B	C	D	E	F	G	H	I
1	Adana Ethnography Museum (Adana)									
2	Alanya Castle Museum (Antalya)									
3	Anamur Museum (Mersin)									
4	Anıtkabir (Atatürk's Mausoleum) Museum (Ankara)									
5	Ankara Art and Sculpture Museum (Ankara)									
6	Ankara Castle Museum (Ankara)									
7	Ankara Ethnography Museum (Ankara)									
8	Ankara Turkish Gendarmerie Museum									
9	Antalya Archaeology Museum (Antalya)									
10	Antalya Museum (Antalya)									
11	Ayasofya (Hagia Sophia) Museum (İstanbul)									
12	Beylerbeyi Palace Museum (İstanbul)									
13	Bimarhane Amasya Museum (Amasya)									
14	Bodrum Museum of Underwater Archeology (Muğla)									
15	Burdur Archaeology Museum (Burdur)									
16	Bursa Foundation Culture Museum (Bursa)									
17	Cappadocia Dark Church Museum (Nevşehir)									
18	Chora Museum (İstanbul)									
19	Çanakkale Namazgah Fort and Museum (Çanakkale)									
20	Çorum Boğazköy Museum (Çorum)									
21	Çorum Museum (Çorum)									
22	Çinili Köşk Archaeology Museum (İstanbul)									
23	Derinkuyu Underground City Museum (Nevşehir)									
24	Dolmabahçe Palace Museum (İstanbul)									
25	Edirne Museum (Edirne)									
26	Ephesus Museum (İzmir)									
27	Galata Mevlevi Lodge Museum (İstanbul)									
28	Gazi Museum (Samsun)									
29	Gaziantep Museum of Archaeology (Gaziantep)									
30	Göbeklitepe Museum (Şanlıurfa)									
31	Hatay Archaeology Museum (Hatay)									
32	Industry and Technology Museum (Ankara)									
33	Intangible Cultural Heritage Museum (Ankara)									
34	İbrahim Hakkı Hz. Museum (Siirt)									
35	İst. Kız Kulesi (Maiden's Tower) Museum (İstanbul)									
36	İstanbul Museum of Modern Art (İstanbul)									
37	İstanbul Toy Museum (İstanbul)									
38	İzmit Museum (Bursa)									
39	Konuralp Museum (Düzce)									
40	Mardin Museum (Mardin)									
41	Memory 15 July Museum (İstanbul)									
42	Mevlâna Museum (Konya)									
43	Miniature Museum of Amasya (Amasya)									
44	Mudurnu City Museum (Bolu)									
45	Muğla Museum (Muğla)									
46	Museum of Anatolian Civilizations (Ankara)									
47	Museum of Republic (Ankara)									
48	Museum of the War of Independence (Ankara)									

49	Museum of Troy (Çanakkale)	Yellow	Green	Grey	Purple	Blue	Pink			
50	Panorama 1453 History Museum (Istanbul)					Blue				
51	Pera Museum (Istanbul)	Yellow	Green	Grey	Purple	Blue	Pink			Orange
52	Rahmi M. Koç Museum (Istanbul)				Purple	Blue				
53	Odunpazarı Modern Museum (Eskişehir)	Yellow	Green	Grey	Purple	Blue				
54	Sakıp Sabancı Museum (Istanbul)				Purple	Blue				
55	Side Museum (Antalya)				Purple	Blue				
56	Topkapı Palace Museum (Istanbul)				Purple	Blue				
57	Turkish Islamic Arts Museum (Istanbul)				Purple	Blue				
58	Yörük Ali Efe Museum (Aydın)				Purple	Blue				
59	Zeugma Mosaic Museum (Gaziantep)	Yellow		Grey	Purple	Blue	Pink			

In the present study, 59 museums providing virtual space services in Turkey were examined in terms of their qualifications and categorized into 6 different classes from 1 (low access) to 6 (high access) according to their accessibility level. This distinction was based on the thresholds determined according to the inclusiveness of the museums examined in the research and the accessibility solutions they offer virtually.

Accordingly, Table 1 shows Architectural plan(A), Axonometric view(B), Information buttons(C), Action buttons(D), 360° space experience(E), Visual support(F), Auditory support(G), Video support(H) and Measure size(I) properties are marked. The examined virtual museums do not have all A, B, C, D, E, F, G, H, I properties at the same time. In this context, 59 virtual museums examined were divided into 6 groups due to their A, B, C, D, E, F, G, H, I characteristics. And as museums have any of these features, their accessibility increases. Accessibility features increase from group 1 to group 6 for users (as can be seen in Figure 5). The categorization of 59 museums with different spatial accessibility characteristics is presented in Figure 6 according to their spatial classes given in Figure 5, which were formed based on the criteria presented in Table 1.

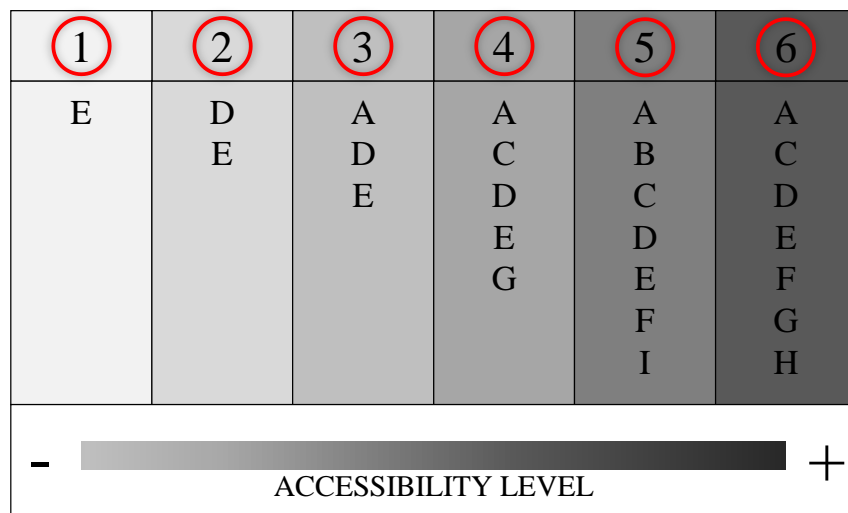


Figure 5. Classification of virtual museums in Turkey by spatial characteristics

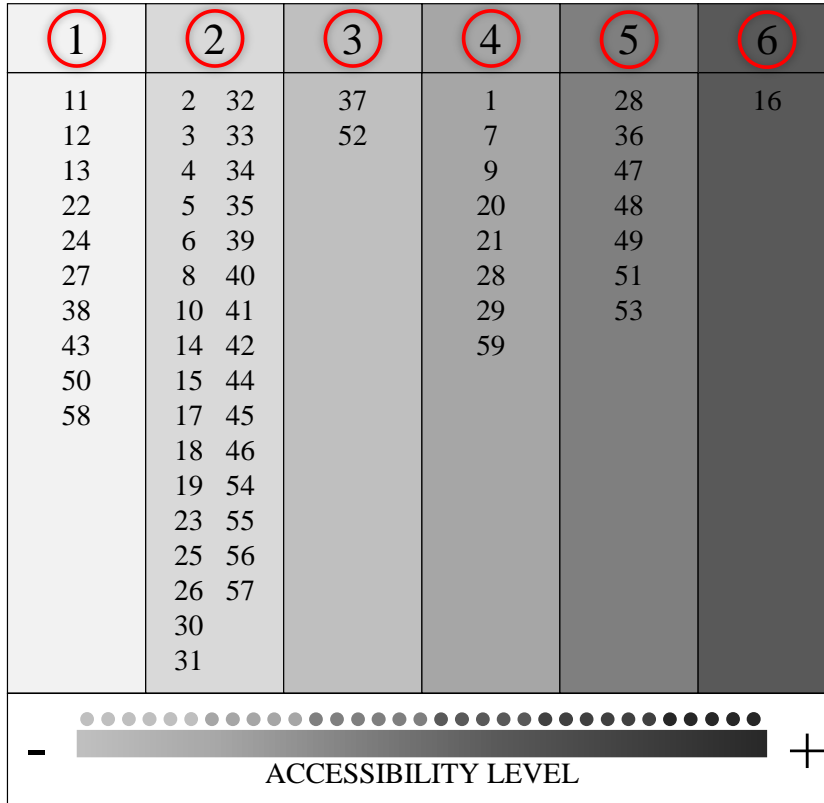


Figure 6. Spatial characteristics-based classification of virtual museums in Turkey

Although the first group of museums does not provide an online service, the web page offers the option to download a file that provides a 360-degree experience of the venue. There is no orientation during the visual interactive experience and space options are very limited (see Figure 7). Therefore, this does not create appropriate solutions for the hearing and the visually impaired.



Figure 7. The first group museums (specified in Figure 6) - 360-degree experience in Dolmabahçe Palace interior

The second group of museums offers a variety of venues with outdoor options around the museum in the online service they provide. The spaces are numbered without specifying a floor plan. The web page is experienced in the space that opens without progressing in any order. Therefore, this situation causes users to experience a lack of perception

of where they are in the museum. Users move through the museum using the arrow keys that appear on the screen after double-clicking on the screen with the mouse. Users can also zoom in and out of the space with the mouse scroll wheel and the + and - buttons on the screen (as shown in Figures 8a-b). However, this situation does not generate appropriate solutions for the hearing and the visually impaired.



(a)



(b)

Figure 8. The second group museums (specified in Figure 6) –Anadolu Medeniyetler Museum virtual space analysis: (a) exterior analysis, (b) interior analysis.

The third group of museums is architecturally more positive in terms of guiding the user by giving information about the floor plan of the museum. As in the second group of museums, there are arrow keys that appear in front of the space when the mouse is double-clicked on the screen while moving around the museum, and on-screen buttons that allow you to zoom in and out to a certain extent (see Figure 9). However, space-defining features, which have increased compared to other groups, still do not offer appropriate solutions for the hearing and the visually impaired.

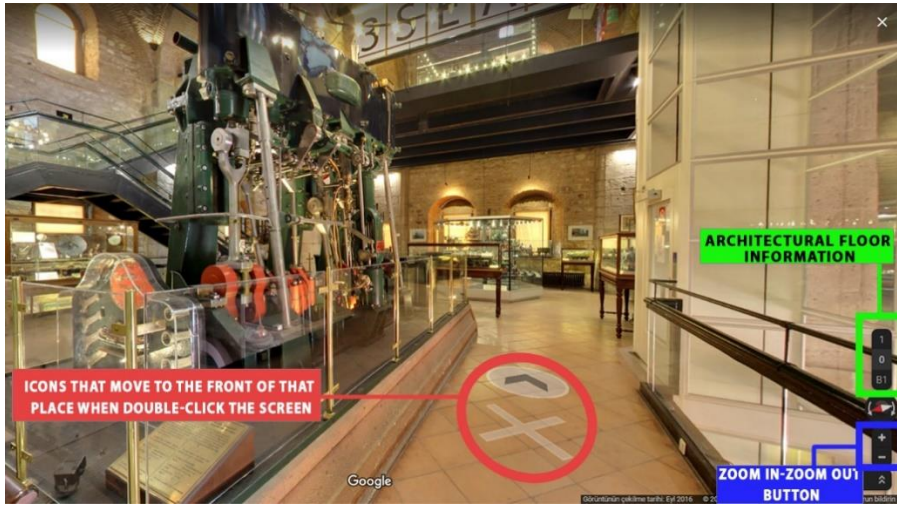
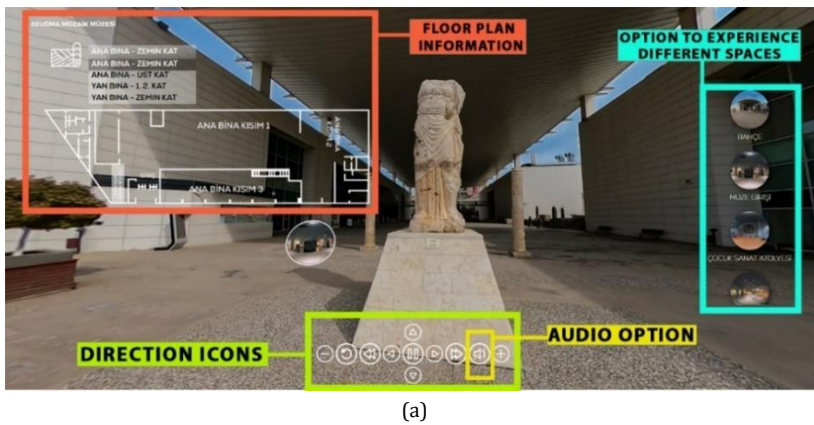


Figure 9. The third group museums (see Figure 6) – virtual space analysis of Rahmi Koç Museum

The fourth group of museums begins with the entrance area outside the museum, and henceforth, the screen shows the architectural floor information. There are keys to orient the screen for the users, a sound option (no information on its active use was found), and dedicated place buttons to navigate between the main places, apart from the architectural floor information. There are information boxes at some points in the interior. In addition, certain points can be reached by moving back and forth in the space, and double-clicking on the screen provides the user with arrows leading to that space (Figure 10a-b). However, museums belonging to this group also do not offer appropriate solutions for the hearing and the visually impaired.

894



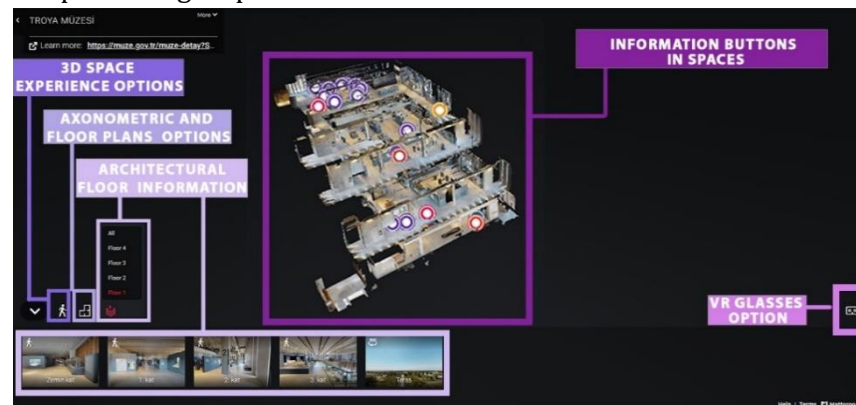
(a)



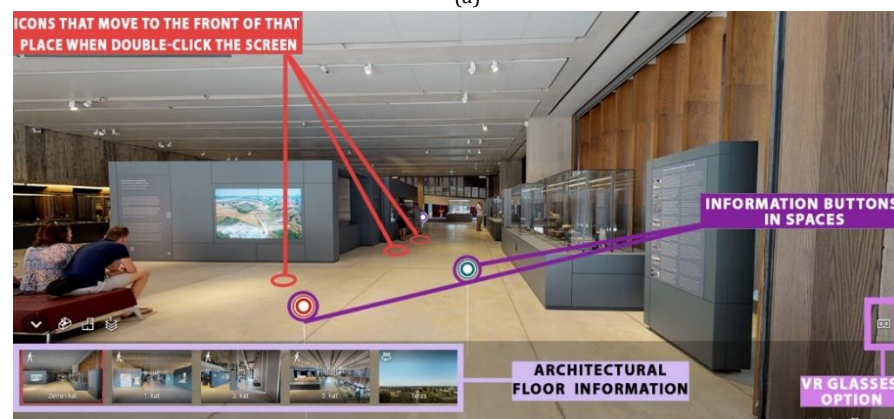
(b)

Figure 10. The fourth group museums (see Figure 6) – virtual space analysis of Zeugma Mosaic Museum: (a) exterior analysis, (b) interior analysis.

The fifth group of museums is more successful not only in the transition between architectural floor plans but also in allowing users to perceive the space with both floor plans and axonometric view options. In this group of museums, there is the option to walk around the museum in 3D, as well as the option to examine it only on the plan plane. The information boxes in the interior, the VR glasses option, the 360-degree interiors, and the terrace floor make Troya Museum that was awarded the “European Museum of the Year” award, one of the longest-running and most prestigious museum awards given annually by the European Museum Forum (EMF) under the auspices of the Council of Europe in 2020 stand out among the virtual museums compared to previous groups (as can be seen in Figures 11a-b). In this context, the “Troya Museum” with its brilliant architecture representing the perception of time through the relationship of light and shadow, and its innovative exhibition that combines contemporary issues with history and asks universal questions about the meaning of war, continues to exist robustly in virtual space (T.R. Ministry of Culture and Tourism, 2021). However, the extent to which it offers universal access to hearing and visually impaired users is controversial, as it has been for the previous groups of museums studied so far.



(a)



(b)

Figure 11. The fifth group museums (see Figure 6) – virtual space analysis of Troya Museum: (a) analysis of the virtual options that the museum has, (b) interior analysis.

Bursa Foundation Culture Museum, which is in the sixth group of museums, has deficiencies like all other museum groups, but it is more successful in terms of inclusiveness, accessibility, and universality. The museum offers the user the opportunity to navigate by providing only spatial information without providing information about the

architectural floor plan. Space options are accessed by an arrow on the left side of the screen. Information boxes in the space provide information about the artworks. Information in the museum is provided not only through visual content but also through video support. However, this is the first museum with the video-audio guide option, which is not available in the other museums presented herein. The guide does not provide support everywhere, but it is activated by clicking on the screen with the mouse at certain points (see Figures 12a-c). While these features are positive for the hearing-impaired user group, providing an option for the visually impaired user group to experience the space and artworks is controversial, as in previous museum groups examined so far.

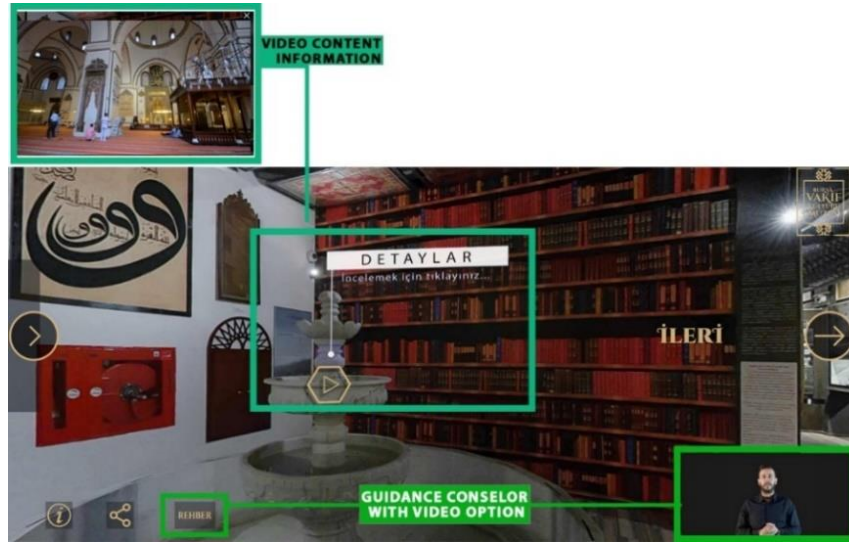


(a)



(b)

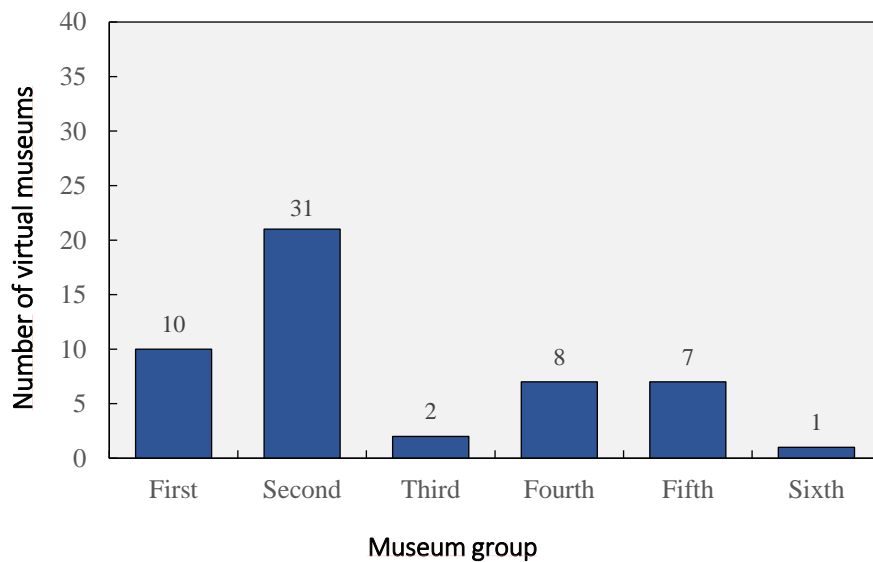
Figure 12. The sixth group museums (see Figure 6) – virtual space analysis of Bursa Foundation Culture Museum-1: (a),(b),(c) interior analysis.



(c)

Today, museums can be visited online and virtually, changing users' experiences with physical space and differentiating their interactions with space. Since the individual physically interacts with the museum space with all of her/his senses, she/he perceives the space in a virtual space with often visual and rarely auditory senses. In this context, when the 59 museums examined in the study are proportioned according to the accessibility level, it can be stated that only 1 of the 59 museums (museum group 6, Bursa Foundation Culture Museum) is more positive than the other groups, although it does not fully meet desired accessibility levels.

Figure 13. The number of virtual museums in the museum group is determined according to accessibility classification in Turkey.



The museum groups examined within the scope of the study have several shortcomings in terms of universal accessibility. As can be seen in Figure 13, 10 of the total museums included in this study are in the first group, while 2 museums are in the third group, 7 museums each are in the fourth and fifth groups, and 1 museum is in the sixth group. Among the museums analyzed in this study, the second group with 31 museums has the highest number of museums. At this point, it is very

important to develop websites that are inclusive of everyone, regardless of their abilities, characteristics, and disabilities (Henry et al., 2014). Web accessibility should be universal for all users, not just those with disabilities. Because “an accessible web is a unique information and communication resource!” (Yeşilada, 2019). In this direction, some aspects of the virtual accessibility of museum spaces need to be improved. Especially with the increasing value of virtual technologies during the COVID-19 pandemic, museums, museums should offer more interactive experiences to users in virtual spaces like they do in physical spaces. The examined virtual museum spaces have different deficiencies in addition to positive features. In this way, web pages need specific solutions to make museum spaces and artworks more inclusive, perceivable, interactive, universal, and generally accessible:

- Descriptive floor plans
- Axonometric planes
- Explanatory information buttons
- Buttons that will allow you to move comfortably in the spaces
- 360o space experience
- Audio guide
- Subtitle-supported guide
- Visual supports
- Video supports
- Color arrangements
- Simulations
- Augmented reality systems (Augmented Reality)
- Virtual reality systems (Virtual Reality)
- Ability to measure the dimensions of space and artwork.

898

Museums fundamentally require a physical connection-communication interaction with spaces and artworks. In virtual museum tours, the spaces are clear, and anyone can experience the space presented to the user in a unique way. The solutions specified in the study, on the other hand, will make the online museum more accessible for users to perceive and experience the space. Solutions to make online museums more accessible and universal for users will make the audiences more engaged with art. Web accessibility needs to be enhanced to increase the universal accessibility, attractiveness, and interactivity of museums and to improve the visitor experience using innovative virtual solutions. The increase of virtual tours and the online serving of a museum in any country in the world has made it accessible to anyone who cannot physically visit that place.

CONCLUSION

The concept of accessibility has evolved over the years; originally it was about removing architectural barriers in a physical space, mainly for wheelchair users and later about the disabled. However, today meaning covers the spectrum of human integration, because at some point in life all people can have limitations. In this context, discussing

the accessibility of a virtual space is also included in this inclusive spectrum (Rojas et. Al., 2020). Users surely have different experiences when viewing artworks in a physical or virtual museum. Visitors' perceptions of space have started to change as they use the new museum forms and spaces that have become increasingly widespread with COVID-19. While these changes cause deficiencies in terms of cultural, contextual, sensory characteristics, and spirit of the place, the increasing presence of virtual tours has become a gain in terms of accessibility. The notion of accessibility emphasized here covers more than just disabled individuals.

In general, the pandemic period can be said to be a period of respite for museums to redesign themselves and examine their ideas on virtualization. Can the user, nevertheless, be a participant in this virtual process in terms of accessibility? It is also essential to ask this question.

It is, therefore, necessary to evaluate the advantages and disadvantages of physical and virtual exhibitions in terms of universal accessibility:

- There are differences between an exhibition in a physical space and an exhibition in a virtual space. While a physical exhibition is connected to the space, virtual exhibitions are related to this virtual place, but this relationship is weaker.
- Virtual exhibitions can be made more accessible, but there is something ritualized about the physical exhibition. While the physical exhibition is situated in a space or context, the virtual exhibition is more fictional on the spatial plane, even though it can provide a visual circulation in the interior of the existing building.
- A virtual exhibition is as authentic as a screen, while a physical exhibition is as unique as its context.
- Physical exhibits are an important aspect of museum culture. In this culture, it is possible to interact with people, souvenirs, posters, etc. even without buying a ticket. There are many situations, from eating to having coffee or taking a break. These situations can also be found in virtual exhibitions, tickets can be purchased from anywhere that can be accessed electronically without physically standing in a queue. People can take advantage of online support even if people are not in contact, but it is not possible to feel the spirit of the space in the same way as in the physical space.
- In order for the physical space of museums to be inclusive, it must fulfill certain mandatory conditions for different types of users. Spaces designed with the orthopedically handicapped, hearing impaired, and visually impaired in mind are important for ensuring universal accessibility.
- Virtualization of museums can be advantageous in terms of accessibility, but the extent of this accessibility requires technological contributions.

• Museums are venues of cultural representation. The simultaneous accessibility of both physical and virtual space will universalize the experience of this representation.

Therefore, as we approach a new era with new pros and cons, it is essential to create a novel form of balance. Since museums have a responsibility to hold a mirror up to society, new ways of experiencing art are needed. In the period when physical access to most art institutions is restricted due to the pandemic, new solutions for exhibition spaces are needed. However, museums have an obligation to be inclusive and make virtual activities more accessible to different user groups, while doing this. It is thought that this obligation can be achieved by updating the articles in the United Nations Convention on the Rights of Persons with Disabilities. In this direction, new articles can be added to Article 20 of the UN Convention on the Rights of Persons with Disabilities, Personal Mobility, to facilitate access to web mobility as content. Furthermore, Article 30 of the UN Convention on the Rights of Persons with Disabilities on Participation in Cultural Life could be updated by adding access provisions to web mobility.

In conclusion making museums, which are the pioneers of cultural heritage, accessible is very important in virtual space as well as in physical space (Lisney, et. Al.,2013). Rather than being a target, technology should be a tool that engages users and gives them access to space and artwork. Museums should no longer be limited to a narrow audience but should appeal to a wider audience by making their exhibits more accessible in virtual spaces. Respecting diversity and different user groups, finding common ground through art, and making it more accessible by producing both physically and virtually solutions will play an important role in the improvement needed in the coming days.

REFERENCES

- Acırlı, Z., & Kandemir, Ö. (2021). Mekân tasarımı için erişilebilirlik kavramı ve boyutları. *GRID - Mimarlık Planlama ve Tasarım Dergisi*, 4(2), pp. 225-248. [In Turkish]
- Arning, K., & Ziefle, M. (2007). Barriers of information access in small screen device applications: The relevance of user characteristics for a transgenerational design. In *Universal Access in Ambient Intelligence Environments: 9th ERCIM Workshop on User Interfaces for All*, Königswinter, Germany, September 27-28, 2006. Revised Papers (pp. 117-136). Springer Berlin Heidelberg.
- Aslanoğlu, O. (2014). Zamanla Değişen Müze Tasarım Anlayışı ve Güncel Bir Örnek Olarak Mercedes-Benz Müzesinin İncelenmesi. Yüksek Lisans Tezi. İstanbul: Mimar Sinan Güzel Sanatlar Üniversitesi Sosyal Bilimler Enstitüsü. [In Turkish]
- Billock, J. (2020). How Will Covid-19 Change the Way Museums Are Built? *Smithson*. <https://www.smithsonianmag.com/travel/how-will-covid-19-change-way-future-museums-are-built-180975022/>
- BM UN. (2006). Convention on the Rights of Persons with Disabilities.
- Chan, E. H., Lee, G. K., & Chan, A. T. (2009). Universal design for people with disabilities: A study of access provisions in public housing estates. *Property Management*, 27(2), 138-146.
- Chan M., & Zoellick R. B. (2011). Summary world report on disability, World Health Organization & The World Bank

- Çağlar, S. (2012). Engellilerin erişebilirlik hakkı ve Türkiye’de erişebilirlikleri. Ankara Üniversitesi Hukuk Fakültesi Dergisi, 61(2), 541-598. [In Turkish]
- Eco, U. (2001). Açık Yapıt. Alexander Calder’in Açık Yapıtları. (M. Bulat, S. Bulat, & B. Aydın, Eds.) İstanbul. [In Turkish]
- EGED, Eğitimde Görme Engelliler Derneği. (2020). Görmeyen Bireylere Yönelik Erişilebilir Dijital Eğitim Materyali Hazırlama Kılavuzu. EGED. [In Turkish]
- Ercan, M. (2013). Kamusal Sanatın ‘Kamusallığı’: Erişim, Aktör, Fayda Yaklaşımı. İdealkent Dergisi(10), pp. 220-255. [In Turkish]
- Evcil, N. (2014). Herkes İçin Tasarım. İstanbul: Boğaziçi Yayınları. [In Turkish]
- Handler, S. (2018). Alternative age-friendly initiatives: redefining age-friendly design. In Age-Friendly Cities and Communities (pp. 211-230). Policy Press.
- Hardt, M. (2006). Design the Term Design. Yumpu.com. Retrieved from <https://www.yumpu.com/en/document/view/48256707/design-definition-michael-b-hardt-designer>
- Henry, S. L., Abou-Zahra, S., & Brewer, J. (2014). The role of accessibility in a universal web. Proceedings of the 11th Web for All Conference, (pp. 1-4).
- Herwig, O. (2012). Universal design: Solutions for a barrier-free living. Walter de Gruyter.
- Holdgard, N. (2014). Online museum practices a holistic analysis of danish museums and their users. PhD Thesis. Copenhagen.
- http-1 https://img.theculturetrip.com/1440x807/smart/wp-content/uploads/2019/09/ctphsept19_013_berlin_wall_berlin_europe_virgili2.jpg
- http-2 <https://kimicontour.dk/prag-og-john-lennon/>
- http-3 <https://www.forbes.com/sites/heatherleighton/2019/07/30/teeter-totters-seesaws-at-the-us-mexico-border/?sh=2a19fba7032>
- http-4 https://www.archdaily.com/628436/brazil-pavilion-nil-milan-expo-2015-studio-arthur-casas-atelier-marko-brajovic?ad_medium=gallery
- http-5 <http://www.numen.eu/installations/tube/cologne/>
- http-6 <https://www.archdaily.com/356993/pixel-cloud-installation-unstable>
- http-7 <https://www.miguel-chevalier.com/work/onde-pixel-2016>
- http-8 <https://www.archdaily.com/598330/wonderwall-likearchitects>
- http-9 <https://theculturetrip.com/europe/finland/articles/arktikum-the-science-centre-and-museum-illuminated-by-the-northern-lights/>
- http-10 <https://www.sitesofconscience.org/en/covid-19/>
- http-11 <https://sanalmuze.gov.tr/>
- http-12 <https://nafidurmus.com/turkiye-de-online-gezilebilen-muzeler/>
- ICOM . (2020). Museums and The Covid-19 Crisis: 8 Steps to Supporting Community Resilience. International Council of Museums.
- Interreg Europe. (2020). Virtual technologies and museums: post-pandemic experiences. Policy Learning Platform.
- Iwarsson, S., & Ståhl, A. (2003). Accessibility, usability and universal design—positioning and definition of concepts describing person-environment relationships. Disability and rehabilitation, 25(2), 57-66.
- Kerckhove, D. D. (2001). The Architecture of Intelligence. Basel: A Birkhauser Publication.
- Kiessner, E. (2020). What are museums going to look like after the COVID-19 pandemic, and can that question shine a new light on long-standing accessibility issues? gsm: Improving Accessibility.
- Lacy, S. (1995). Debated territory: Toward a critical language for public art. In S. Lacy, Mapping the Train: New genre public art. Seattle: Bay Press.
- Lisney, E., Bowen, J. P., Hearn, K., & Zedda, M. (2013). Museums and technology: Being inclusive helps accessibility for all. Curator: The Museum Journal, 56(3), 353-361.
- Merritt, E. (2020). Reinventing Museums: Pandemic Disruption as an Opportunity for Change. American Alliance of Museums.
- Ministry of Family, Labor and Social Services of the Republic of Turkey. (2021). Erişilebilirlik Kılavuzu. Retrieved from https://www.aile.gov.tr/media/65613/erisilebilirlik_kilavuzu_2021.pdf [In Turkish]
- Montagu, A. (1986). Touching: The Human Significance of the Skin. New York: Harper&Row.

- Network of European Museum Organisation. (2021). Follow-up Survey on the impact of the COVID-19 pandemic on museums in Europe - Final Report. NEMO.
- Pallasmaa, J. (2011). *Tenin Gözleri: Mimarlık ve Duyular*. İstanbul: YEM Yayın. [In Turkish]
- Partarakis, N., Klironomos, I., Antona, M., Margetis, G., Grammenos, D., & Stephanidis, C. (2016). Accessibility of cultural heritage exhibits. In *Universal Access in Human-Computer Interaction. Interaction Techniques and Environments: 10th International Conference, UAHCI 2016, Held as Part of HCI International 2016, Toronto, ON, Canada, July 17-22, 2016, Proceedings, Part II 10* (pp. 444-455). Springer International Publishing.
- Persson, H., Åhman, H., Yngling, A. A., & Gulliksen, J. (2015). Universal design, inclusive design, accessible design, design for all: different concepts—one goal? On the concept of accessibility—historical, methodological and philosophical aspects. *Universal Access in the Information Society*, 14, 505-526.
- Rojas, H., Renteria, R., Acosta, E., Arévalo, H., & Pílares, M. (2020, October). Application of accessibility guidelines in a virtual museum. In *2020 3rd International Conference of Inclusive Technology and Education (CONTIE)* (pp. 73-79). IEEE.
- T.R. Ministry of Culture and Tourism. (2021). 'Avrupa Yılı Müzesi Ödülleri'. Retrieved from <https://twitter.com/TCKulturTurizm/status/1390357563087204353>
- Tallant, S. (2020). Rethinking museums for the future. *The UNESCO Courier*(3), 12-14.
- Theil, A., Creed, C., Shaqura, M., Olson, N., Holt, R. J., Sarcar, S., & Murray, S. (2022, October). Multidisciplinary Perspectives on Designing Accessible Systems for Users with Multiple Impairments: Grand Challenges and Opportunities for Future Research. In *Proceedings of the 24th International ACM SIGACCESS Conference on Computers and Accessibility* (pp. 1-6).
- Tatal, O. (2012). *Tasarımda Kullanıcı ya da İnsan İçin Tasarlamak*. Mimarlar, 4(8). [In Turkish]
- Tatal, O. (2015). Erişebilirlik, Erişebilirlik, Erişemedik. *Mimarlık Dergisi*(385). [In Turkish]
- Tatal, O. (2018). Herkes için Tasarım: Geçmişten Geleceğe. *Tasarım Dergisi*(282), pp. 68-69. [In Turkish]
- Vajda, A. (2020). Museums and Online Spaces. *The Society Building Role of the Museums during the Pandemic. communication*(7), 42-53.
- United Nations. (2009). *Convention on the Rights of Persons with Disabilities and Optional Protocol*. Retrieved from <https://www.un.org/disabilities/documents/convention/convoptprot-e.pdf>
- Vermeeren, A. P., Sabiescu, A., Calvi, L., & Stuedahl, D. (2018). *Future Museum Experience Design: Crowds, Ecosystems and Novel Technologies*. Museum Experience Design - Crowds, Ecosystems, and Novel Technologies Springer.
- Yeşilada, Y. (2019). *Web Erişilebilirliği: Standartlar ve Kılavuzlar*. Middle East Technical University. [In Turkish]
- Yılmaz, İ. (2020). *İnteraktif Sanat ve Dijital Müzeler*, Yayınlanmamış YL Tezi, T.C. Haliç Üniversitesi, Lisansüstü Eğitim Enstitüsü, Grafik Tasarım Anasanat Dalı. İstanbul. [In Turkish]

Resume

Cemre Kılınc has been working as a lecturer at Bingöl University, Department of Architecture since 2020. She continues her doctoral studies at Eskişehir Technical University, where she completed her master's degree. Her researches are architectural design, accessibility, inclusivity, public art.

Prof. Dr. Osman Tatal is currently working at Eskişehir Technical University, Faculty of Architecture and Design, Department of Architecture. His researches



mainly focus on urban and architectural design which include accessibility, universal design/inclusive design/design for all and emergency architecture. He has numerous Project Management experiences and publications about accessibility for all.