COLECCIÓN CONOCIMIENTO CONTEMPORÁNEO

Diseño y evolución social

Coord.
M. Mar Martínez-Oña

Dykinson, S.L.

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1. DISEÑO Y EVOLUCIÓN SOCIAL

El siglo XXI establece un nuevo uso del diseño como factor fundamental de innovación social e innovación tecnológica, donde se intensifica la sostenibilidad como un valor indisociable en la actual sociedad. Sostenibilidad, que se convierte en un factor imprescindible de la evolución social que demanda el siglo XXI. Estos tres factores, -la innovación social, la innovación tecnológica y la sostenibilidad- articulan los nuevos pilares del nuevo uso del diseño que se desarrolla en el actual siglo.

Este nuevo contexto sociocultural del siglo XXI se presenta en el libro "Diseño y Evolución social", en el que se publican una serie de investigaciones que interrelacionan el diseño con la innovación en diferentes disciplinas académicas. Se exhibe entonces, un trabajo colectivo realizado por investigadores e investigadoras, donde se aplica el diseño a diversas áreas académicas. Un libro con un total de 44 capítulos en el que se expone la intersección del diseño en diferentes áreas del conocimiento, que ofrece como resultado la reafirmación de la relación del diseño con la sociedad del siglo XXI, y con la evolución social.

El presente libro se divide en varias secciones. Comenzando con la relación existente entre el diseño en el patrimonio arquitectónico y museos donde destacan textos de investigación en arquitectura, urbanismo, museos y exposiciones. La relación entre la educación y el diseño se pone de manifiesto en diferentes capítulos relacionados no solo con la docencia del diseño y con diseño, sino que se establece la innovación educativa a través de diversas enseñanzas de varias áreas como la artística, matemáticas, etc., fomentando con ello, nuevas experiencias de

aprendizaje. Para pasar a aquellos apartados más tradicionales del diseño, como diseño de moda y de producto, enfocados en la innovación social y tecnológica, y donde la sostenibilidad desarrolla un rol fundamental. La innovación social que presenta un nuevo uso del diseño en el siglo XXI también demanda una mayor equidad e igualdad a través del estudio del género en el diseño, favoreciendo la visibilidad de artistas femeninas junto con la necesidad de reescribir una nueva historia del diseño. Para concluir con la innovación tecnológica que alcanza su máximo nivel en la interrelación de la Inteligencia Artificial con el diseño, donde se analiza su utilización en diversas disciplinas académicas.

Todas estas áreas académicas al aplicar el diseño justifican la afirmación del diseño como una disciplina interdisciplinar. Que demanda una nueva sociedad, con una presencia activa de responsabilidad social a través de la innovación social y tecnológica, de la sostenibilidad y de la igualdad.

M. Mar Martínez-Oña
Universidad de Diseño, Innovación y Tecnología (UDIT)

SECCIÓN I.

DISEÑO EN EL PATRIMONIO ARQUITÉCTONICO Y LOS MUSEOS

PROMOTING INCLUSIVE DESIGN IN AN EXHIBITION THROUGH A VIRTUAL TOUR: UNIVERSITY OF VALLADOLID'S ARELLANO ALONSO MUSEUM OF AFRICAN ART

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1. INTRODUCTION

University of Valladolid's Arellano Alonso Museum of African Art ('Museo de Arte Africano Arellano Alonso de la Universidad de Valladolid') is located in the Palace of Santa Cruz ('Palacio de Santa Cruz'), in Valladolid, Spain. This building is known as one of the first Spanish Renaissance palaces and was originally built as a University Hall ('Colegio Mayor de Santa Cruz') for students without financial resources by Cardinal Pedro González de Mendoza. The building work started in 1486 and the inauguration was in 1491. Organized around a three-story Renaissance courtyard (Figure 1), it also currently houses the Rectorate, the Historical Library of the University of Valladolid and the Christ of Light Chapel ('Capilla del Cristo de la Luz').

The Museum is managed by the Alberto Jiménez-Arellano Alonso Foundation ('Fundación Alberto Jiménez-Arellano Alonso'), a non-profit organization affiliated with the University of Valladolid (UVa) created on May 3, 2004, by Alberto Jiménez-Arellano Guajardo and Ana Alonso Cuadrado, who wanted to honor their prematurely deceased son and exhibit the various pieces that their family had collected over the years.

In order to carry out a virtual tour of the Museum, on February 9, 2023, the Foundation signed an agreement with the LAB/PAP, Laboratory of Architectural, Heritage and Cultural Landscape ('Laboratorio de Paisaje Arquitectónico Patrimonial y Cultural'), a Research Group of the University of Valladolid, on the initiative of its director, Darío Álvarez Álvarez, within the activities of the Research Project 'Accessibility and Inclusive Design in Heritage Landscapes. Analysis, Action Strategies and Information Design Models' ('Accesibilidad y Diseño Inclusivo en Paisajes Patrimoniales. Análisis, Estrategias de Actuación y Modelos de Diseño de Información').

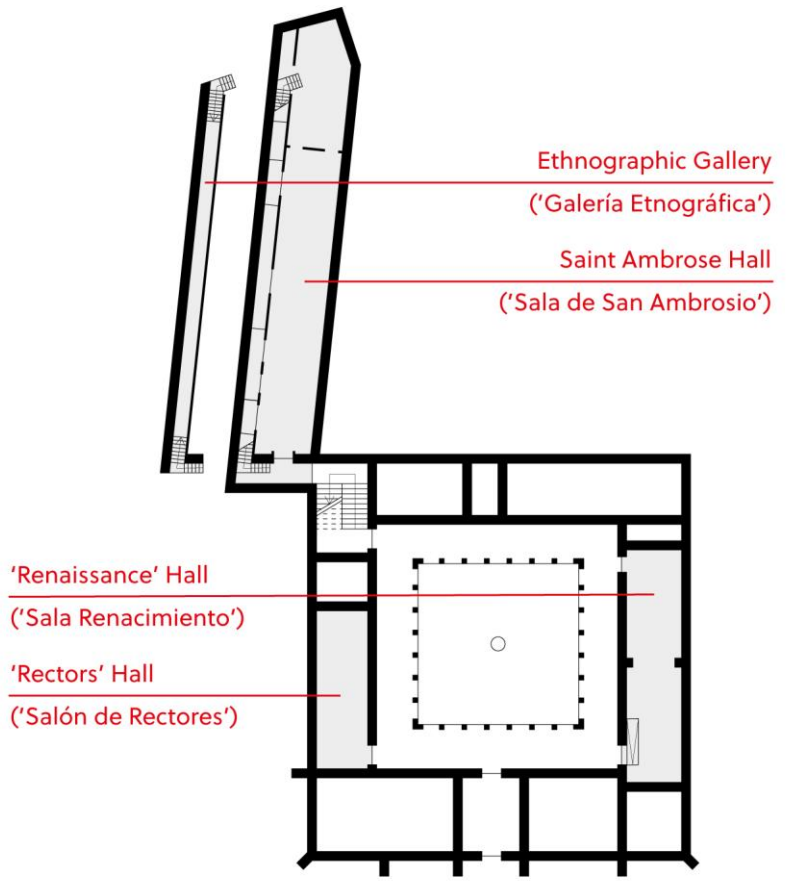
FIGURE 1. *Renaissance courtyard of the Palace of Santa Cruz*

Source: Photograph by the authors, 2024

The Museum displays various collections of different artistic typologies, origins and chronologies, such as a collection of contemporary pictorial and sculptural art, a collection of oriental art and a permanent collection of sub-Saharan African art. This last collection can be visited through the virtual tour developed and is displayed in three rooms: 'Rectors' Hall ('Salón de Rectores'), 'Renaissance' Hall ('Sala Renacimiento') and Saint Ambrose Hall ('Sala de San Ambrosio'), which has an Ethnographic Gallery (Figure 2). Each of these rooms houses

different pieces that share a common theme, and are therefore grouped as smaller collections.

FIGURE 2. *Floor plan of University of Valladolid's Arellano Alonso Museum of African Art with the four exhibition rooms that house the collection of sub-Saharan African art.*



Source: Floor plan by the authors, 2024

In the 'Rectors' Hall (Figure 3) different pieces from the collection of traditional African coins are displayed, divided into: commodity coins and metal coins. Commodity coins could be: agricultural products (cocoa, tobacco, kola nuts, seeds), fabrics (cotton, silk or raffia fabrics), minerals (salt, agate, quartz, quartzite), shells (conch, cowries, olives),

livestock and even slaves. They were used to purchase goods and services, but also to pay taxes, debts, or other symbolic payments, such as dowry. Metal coins were objects (weapons, agricultural implements, ingots or musical instruments) that originally had a specific utilitarian function, which they later lost to become a medium of exchange for goods or services. These coins are characterized by the diversity of shapes and metals with which they were made: gold, silver, iron, bronze and copper.

FIGURE 3. *'Rectors' Hall.*

Source: Photograph by the authors, 2024

The 'Renaissance' Hall (Figure 4) houses part of the collection of African figurative terracotta sculptures, whose common motif is the human figure, and since 2019, the collection of terracotta horse riders. The exhibition makes a chronological review through the sculptures of different cultures settled around the basins of the Niger and Congo rivers, places where it was easy to find the raw material with which they were made: clay. Knowledge of these cultures is rather recent. The first traces were found at the beginning of the 20th century, usually by chance, while archaeological excavations based on scientific criteria are subsequent and scarce. In addition, the predominance of oral tradition has caused a great loss of information that would have helped to contextualize the making of the pieces and their creators. The result,

therefore, is ignorance regarding the origin and the social structure of these cultures.

FIGURE 4. *'Renaissance' Room.*

Source: Photograph by the authors, 2024.

In the Saint Ambrose Hall (Figure 5) different pieces from the Kingdom of Oku have been exhibited since 2012, which was the first time that they were displayed outside their original location. The Kingdom of Oku is located to the northwest of the Republic of Cameroon. It is one of the few traditional kingdoms that still exists in the African territory to this day, preserving its sovereigns, to a great extent, their ancestral authority. It has remained slightly isolated due to its complicated orography, which has allowed it to preserve many of its traditions. The collection is made up of fetishes, musical instruments, masks from Secret Societies and royalties, objects that are symbols of royal power and that only the sovereign can use, such as chief beds or thrones. These pieces are carved out of wood by skilled artisans who are highly respected by the community. Masks are made up of a garment that covers the body and an element that is placed on the head which covers the face. They were used at special events, such as parties and ceremonies.

FIGURE 5. *Saint Ambrose Hall.*

Source: Photograph by the authors, 2024.

In the Ethnographic Gallery (Figure 6) there are objects from different African cultures and eras. They have in common their ethnographic character, since they are pieces that show the customs and traditions of African peoples.

FIGURE 6. *Ethnographic Gallery*

Source: Photograph by the authors, 2024.

2. OBJECTIVES

Currently, a large number of museums offer online sites to provide information about their contents and other information of interest to the public, such as cultural activities, exhibitions, collections, opening hours, etc. Not only is the Internet a more complete way of publicizing the institution, allowing more people to become aware of its existence, but its use has also enabled greater interaction with both public and professionals. (Silva de Macedo & Mantelli Cozz, 2005, p. 235). This is mainly due to the immediate access people have to all this information, regardless of time and place, and the ability to include a large amount of different digital contents and tools on a single website, a single space, making them accessible to a greater number of users on a global scale. Furthermore, digital information is generally easier and faster to organize, modify and update (Moritsch, 2004, p. 142).

Thus, digital technologies currently play a fundamental role in the dissemination and the preservation of cultural heritage (Dias & Cuperschmid, 2019, p. 208). The virtual tour is one of the most promising digital tools to emerge in recent years and had a significant impact on museum activities during the Covid-19 pandemic (Anita et al., 2021). A virtual tour is a digital recreation of a space or environment designed to be viewed on electronic devices (that have a screen) and to allow interaction within it. If effectively designed, this tool can be highly useful for heritage, which is why it is increasingly being implemented in museums, monuments, archaeological sites, natural landscapes, etc., since it offers users 'the ability to engage in multiple forms of media (text, image, audio, sound, video, augmented reality and virtual reality components) […] reverse, revisit, translate and read text tailored for different user groups, […] immersion in well-crafted theme-games, etc.' (Foo, 2008, p. 23). In addition, it provides access to pieces or collections that are not currently on display, environments or works in restoration, or spaces that are either difficult to access or closed to the public.

The level of immersion of users in a virtual tour depends, firstly, on the method used to recreate the environment: 360º panoramic images or 3D

models. The former method consists of capturing 360º panoramic images at different key points of a space that are later connected, while the latter consists of modelling the space in 3D. If it is done realistically enough, this last method is usually more immersive, since users are generally able to move freely to any given point of the space, in the same way they would during a physical tour, something that cannot be done so easily with the 360º panoramic images, since the views of the space are predetermined.

Secondly, it depends on the electronic device used to visualize the virtual tour and how far apart its screen is from the eyes of the users, since it can be: a short distance (virtual reality glasses) or a medium/long distance (smartphone, tablet, computer, television, etc.). The former is usually more immersive, since it is able to create the illusion in the eyes of the users of being surrounded by the specific space recreated in the virtual tour, instead of seeing it like in the latter, in a screen that is surrounded by the actual space in which users really are.

Thirdly, it could also depend on the interactive elements (usually called 'hotspots') that appear in the virtual tour and the degree of attraction or distraction that they produce in the users, as well as their number, design, color, size, etc. Generally, there are always elements such as arrows or a cursor that allow users to move through the space, but there can also be icons that open information panels, images, videos, etc.; plans or maps that show the space and the position in which the users are; audios; short texts; language or option menus; etc. The inclusion of all these elements depends on the amount of information or the number of functionalities wanted to be given to users.

Bearing in mind all these facts, although the initial objective of the virtual tour proposed by the Alberto Jiménez-Arellano Alonso Foundation is to reflect the various changes that have been made to the exhibitions over the years, such as the inclusion of new pieces, the changes in the objects on display in the rooms, the addition of new collections of pieces, the exchange of objects between rooms, the updating of the information of some pieces, etc., the creators of the virtual tour (Juan José Merillas Benito, Nieves Fernández Villalobos and Darío Álvarez Álvarez) saw the opportunity to use this digital tool as a mechanism to make

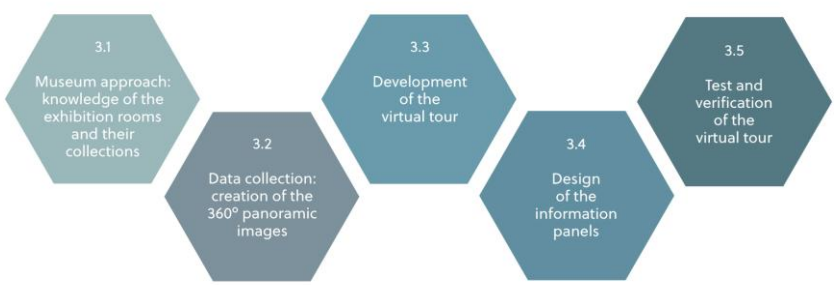
the Museum more accessible and inclusive. Adapting cultural environments to make them more inclusive is a necessity for the transmission of culture and can also revitalize them, by encouraging active participation in their content by a greater number of users. (Puyuelo Cazorla et al., 2017, p. 12).

Therefore, with this objective in mind, it is decided that special attention should be paid to the formal, ergonomic and design aspects of the virtual tour and its interactive elements. It is necessary to communicate information in an accessible and understandable way, in terms of content, presentation and design, while also providing only the essential information, to not overwhelm users. The aim is to develop a useful, informative, intuitive and attractive tool that allows as many users as possible to visit the Museum easily, at any time and from any place.

3. METHODOLOGY

In order to carry out the virtual tour presented here, a qualitative and exploratory methodological approach was used, adopting the following procedure (Figure 7): (3.1) Museum approach: knowledge of the exhibition rooms and the collection, (3.2) data collection: creation of the 360º panoramic images, (3.3) development of the virtual tour, (3.4) design of the information panels and (3.5) test and verification of the virtual tour.

FIGURE 7. *Outline of the methodology used to carry out the virtual tour.*



Source: Drawing by the authors, 2024.

The programs used during the development of the virtual tour were: '3DVista Stitcher 4' to create the 360º panoramic images, due to its intuitive and effective approach, that allows to easily obtain those; 'Adobe Photoshop', a widely used editing software for images and photographs, to edit the 360º panoramic images; '3DVista Virtual Tour Pro' to create the virtual tour, an intuitive software that has multiple options for personalization, updating of the data, inclusion of interactive personalized elements, implementation of items, etc.; and 'Adobe Illustrator', a commonly used graphic design software, to create accessible elements, icons, graphs, etc.

3.1. Museum approach: knowledge of the exhibition rooms and the collection

Meetings were held with Oliva Cachafeiro Bernal, Director of the Museum, and Cristina Bayo Fernández, Coordinator of Cultural Activities and Cultural Manager of the Museum, in order to define specific objectives and visit the Museum to study the collection of sub-Saharan African art and its layout. 'The engagement of museum professionals is crucial to ensure an even greater connection between a cultural site and its digital replica' (Angeloni, 2022, p. 40). It was also established that the virtual tour would be accessed through the Museum website, so Internet connection and an electronic device with a screen would be needed to visualize it.

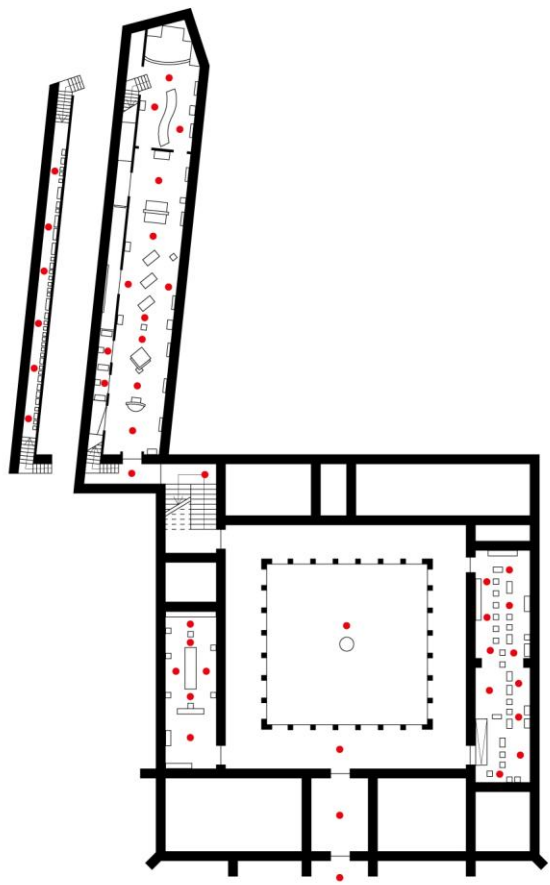
3.2. Data collection: creation of the 360º panoramic images

It was also decided that the virtual tour would be made using 360º panoramic images to recreate the space, since it would be quicker to develop and implement. The Museum staff agreed that the detail of these images was enough to faithfully capture the Museum exhibitions and essence. Therefore, it was necessary to carefully determine and study the key points of the different rooms in which the 360º panoramic images would be captured, so that the visiting route was as fluid as possible (Figure 8).

Thus, three 360º panoramic images are planned to guide users from outside to inside the Palace, ending with another one that places them in

the center of the courtyard, to admire its architecture. For the exhibition rooms, six 360º panoramic images are developed to tour the 'Rectors' Hall, eleven to explore the 'Renaissance' Hall, and an intermediate one after the courtyard leads users to the Saint Ambrose Hall, which is visited through thirteen, and whose Ethnographic Gallery is toured through six.

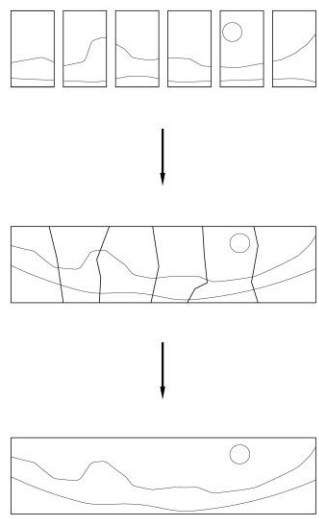
FIGURE 8. *Floor plan of University of Valladolid's Arellano Alonso Museum of African Art with the key points selected.*



Source: Floor plan by the authors, 2024.

360º panoramic images can be obtained in several ways. The method used here to create each of them is to take photographs of the environment from a single point and in several directions, which are then stitched together using a specific program (Figure 9). The number of photographs and the number of directions in which they are taken vary depending on the type of camera. In this case, the equipment used to take the photographs consisted of a 360º camera (Samsung Gear 360 Full HD), the camera of an iPad (iPad Pro (12,9)), a digital camera (Olympus OM-D E-M10 Mark II) with an objective (M.Zuiko Digital ED 14-42mm F3.5-5.6 EZ) and a tripod.

FIGURE 9. *Process of creating a 360º panoramic image*

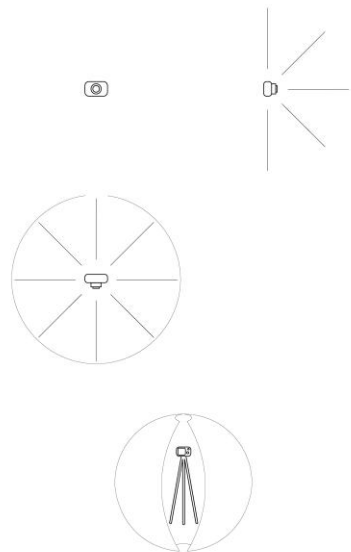


Source: Drawing by the authors, 2024

Although it seemed easier and more suitable to use the 360° camera or even the camera of the iPad, because of the possibility of taking photographs with a fisheye effect, and therefore, capturing a larger part of the space with fewer photographs, it turned out that they did not match the desired quality, mainly due to the darkness of the Museum rooms. Therefore, among the three camera options, it was finally decided to use the digital camera, which took photographs with more detail.

The process of taking photographs with the digital camera consists of taking around eight photographs in eight different directions in a horizontal plane, around eight photographs in eight different directions in a slightly upward-tilted plane, around eight photographs in eight different directions in a slightly downward-tilted plane, around three photographs in an upward direction, and around three photographs in a downward direction (in short, between thirty and sixty photographs per 360º panoramic image) (Figure 10).

FIGURE 10. *Process of taking photos with the digital camera for the 360º panoramic images.*

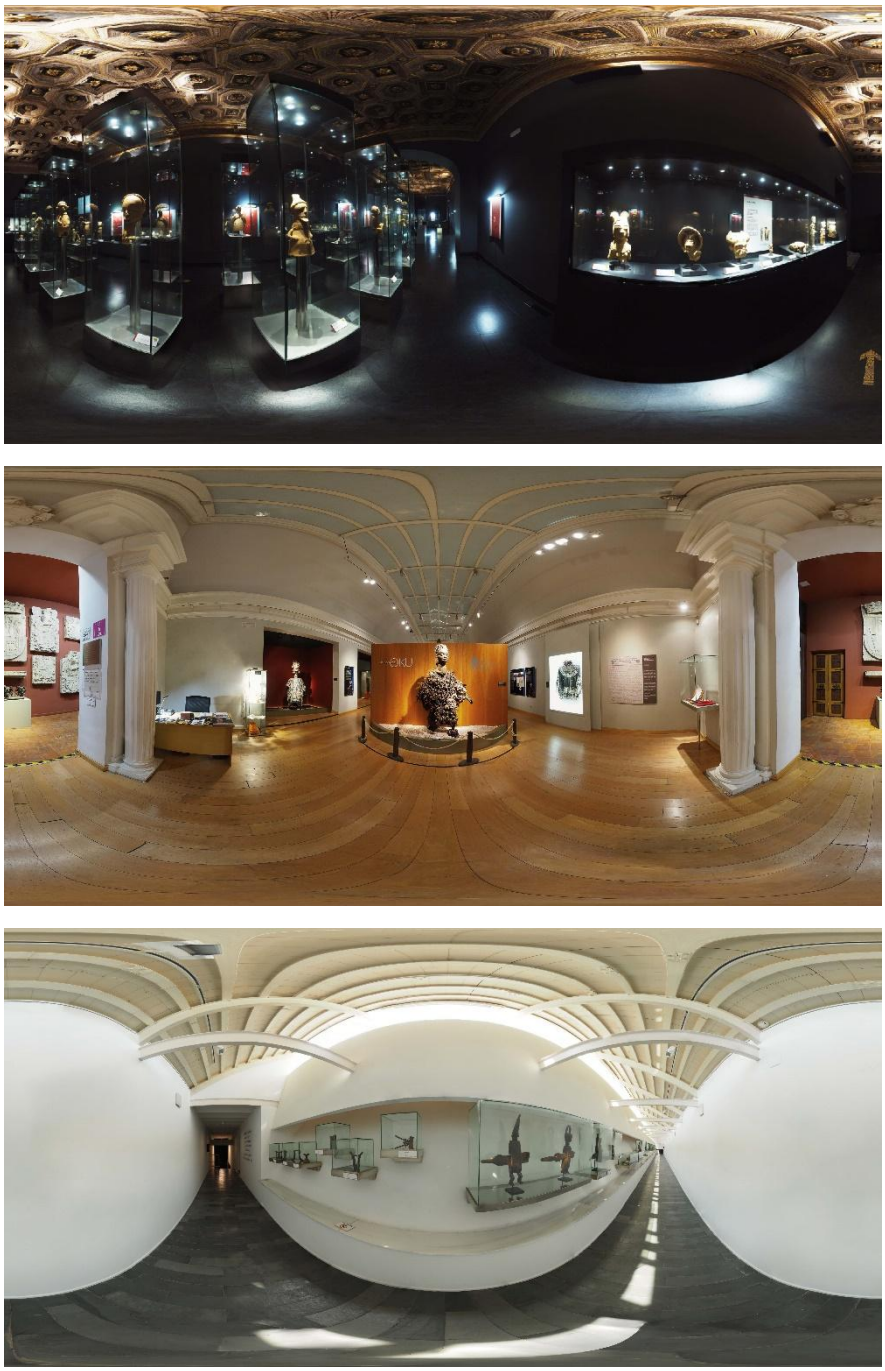


Source: Drawing by the authors, 2024.

The directions in which the photographs are taken—in the horizontal plane, a slightly upward-tilted plane, and a slightly downward-tilted plane—do not need to be exactly the same for each plane, but they should be similar. Once the starting direction to take the first photograph is chosen (preferably the same one for all the planes), the camera is rotated to the right or to the left (preferably the same direction for all the planes) until it reaches the starting direction, that is to say, it completes a circumference in the respective plane. For the photographs taken in an upward and downward direction, the directions are obtained similarly.

Once the starting direction to take the first photograph is chosen, the camera is rotated forward or backward until it completes an arc that covers the upper and lower parts of the space. The reason for taking such a high number of photographs is the need to capture the entire environment, and also, the need to photograph at least 30% of the common part of the space between one photograph and the one in the following direction. In this way, the program '3DVista Stitcher 4' is able to join them together and create each 360º panoramic image, by stitching the common spaces among all the photographs imported for each key point.

FIGURE 11. *Examples of 360º panoramic images: façade of the Palace of Santa Cruz, 'Rectors' Hall, 'Renaissance' Hall, Saint Ambrose Hall and Ethnographic Gallery.*



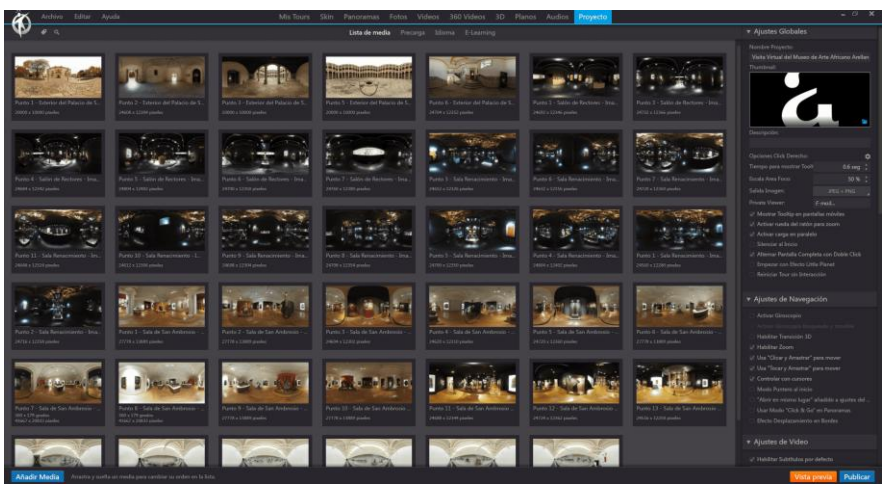
Source: Photographs by the authors, 2024.

3.3. Development of the virtual tour

To develop the virtual tour, all the 360º panoramic images created were imported into a 'new project' in the program '3DVista Virtual Tour Pro', and various adjustments were made so that their quality was accurately reflected. The maximum and minimum zoom levels for the images were also established (Figure 12).

Next, the different 'arrows' that allow users to move around the virtual space, and therefore, around the Museum, were introduced. Then, each arrow was assigned the function it must fulfil when selected, make another 360º panoramic image appear and replace the current one that is being shown (taking the continuity among spaces into account). In this way, a sensation of movement through the Museum is generated when clicking on the arrows. The interaction among the images allows users to 'walk' through the captured views, which complements the virtual tour experience (Napolitano et al., 2018).

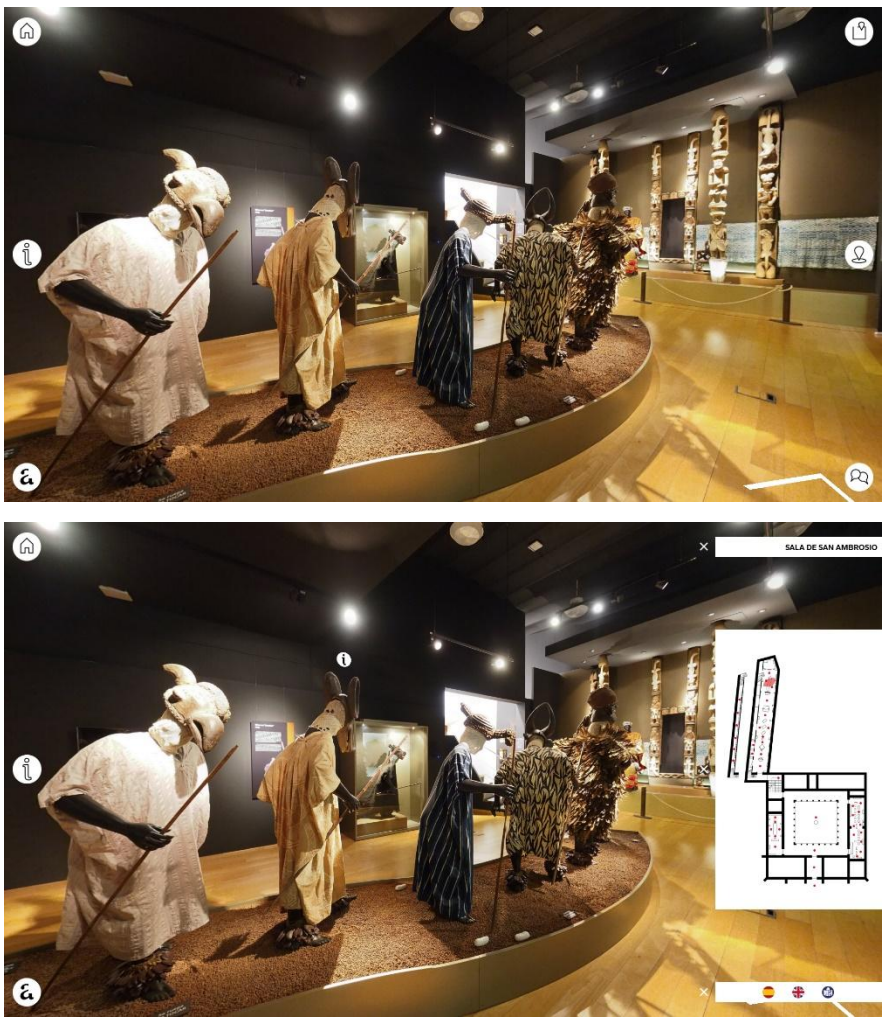
FIGURE 12. *Screenshot of the forty-one 360º panoramic images of the virtual tour and the settings panel for them in the program '3DVista Virtual Tour Pro'.*



Source: Screenshot by the authors, 2024.

There are three icons on each side of the screen which show up or hide, activate or deactivate some add-ons and functions when users click on them: black elements that represent the function they perform inside white circles (Figure 13).

FIGURE 13. *Screenshots of the virtual tour in the Saint Ambrose Hall with the icons and the functions they show or hide, activate or deactivate when users click on them.*



Source: Screenshots by the authors, 2024.

At the top left, there is an icon that shows the home screen. In the middle left, an icon that allows users to hide or show the icons of the information panels (visible by default). And at the bottom left, an icon that shows the credits in an information panel.

At the top right, there is an icon that displays the name of the room where the users are located, within the virtual tour. In the middle right, an icon that shows the floor plan of the Museum and allows to identify the key point in which users are located and which ones they can click on (doing so shows the 360º panoramic image of the selected key point); furthermore, they can easily identify their viewing direction within the space thanks to an integrated area viewer and the inclusion of the display cases of each room, which also help users orient themselves. And at the bottom right, an icon that shows a language menu, which allows users to change the language of the information provided. All these add-ons and functions appear when users click on the icons, which are replaced by the element they display, and can be hidden by clicking on the 'x' that appears to the left of the respective element, making the icons appear again.

The program 'Adobe Illustrator' was used to create all the virtual tour elements and icons.

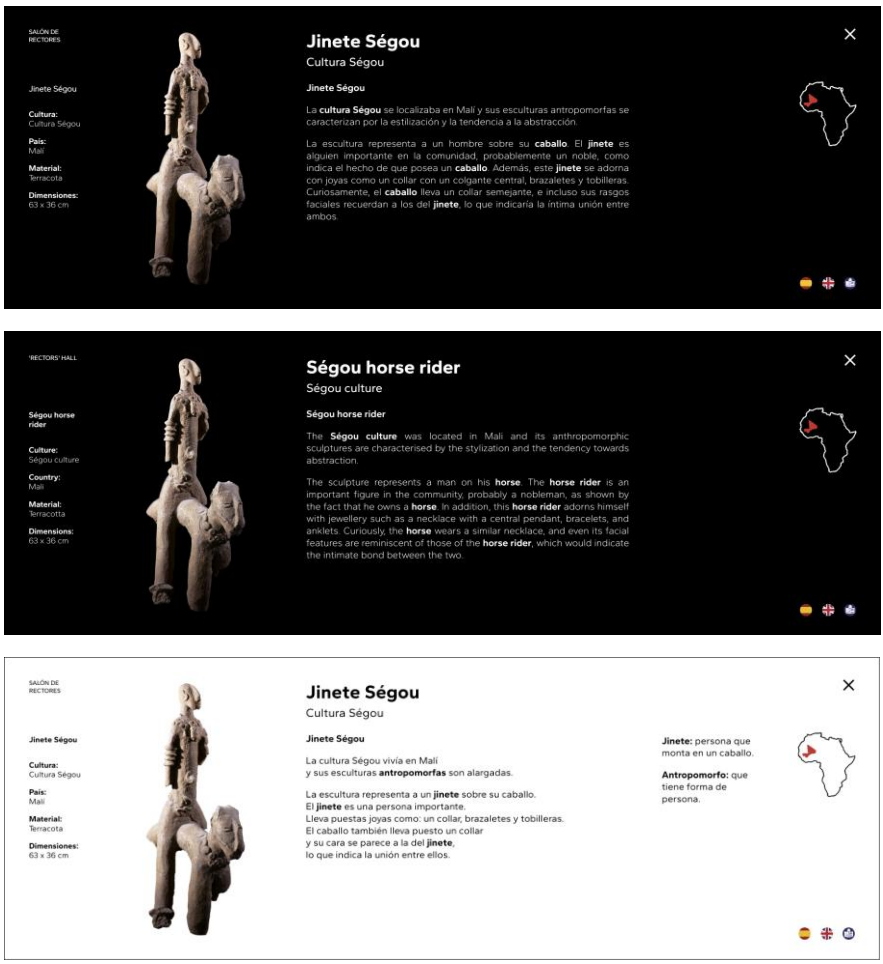
3.4. Design of the information panels

Several information panels were designed in order to provide information about the Museum rooms and the most representative objects in the collection of sub-Saharan African art. A total of sixty-three information panels are available, which can be accessed intuitively by clicking on an icon: a black letter 'i' inside a white circle. By opening the information panel of each room and object, users can learn more about the pieces and their details. In addition, the background of the virtual tour becomes clearer so as not to distract users, allowing the information provided to be the main focus.

Each information panel consists of a horizontal strip divided vertically into three areas, in which different contents appear: on the left, the name of the room in which users are located, a summary of the data known

about the room or the piece (name, culture, country, material and dimensions) and a photograph of it; in the middle, a descriptive text and a glossary (only when the information is in easy-to-read Spanish); and on the right, an 'x' that closes the information panel, a map of Africa that shows the location of the country which the described piece is from, and a language menu (Figure 14).

FIGURE 14. *Example of an information panel with the information in Spanish, an information panel with the information in English and an information panel with the information in easy-to-read Spanish.*



Source: Screenshots by the authors, 2024

Most of the photographs of the pieces that appear in the information panels were provided by the Museum staff. Since they were taken at different times and places, the images had varied backgrounds, so an intensive work of homogenization was carried out. In some cases, new photographs were taken, and some showcases were opened to avoid light reflections in the photographs.

The texts that describe the pieces were written by the Museum staff. In order to include them in the information panels, an initial simplification work was carried out, slightly modifying the wording and the order in which the information appeared, so as to homogenize it. Since one of the main objectives of the virtual tour is to make it accessible to as many users as possible, the texts were translated into English and easy-to-read Spanish. Easy-to-read is a method that includes a set of guidelines and recommendations regarding the drafting of texts, the design/layout of documents and the validation of their comprehensibility, aimed at making information accessible to people with reading comprehension difficulties (Asociación Española de Normalización [UNE], 2018, p. 7). The standards related to accessibility and easy-to-read were considered for the translation of the texts into easy-to-read Spanish, as well as for the design of the information panels (colors, fonts, font sizes, etc.).

3.5. Test and verification of the virtual tour

The final texts of the information panels in Spanish, reordered for homogenization, were reviewed by the Museum staff. Likewise, the English texts were revised by a language specialist, Stilian Krastev. In order to ensure the correct translation of the easy-to-read Spanish texts, Nieves Fernández Villalobos coordinated several validation sessions at the Technical School of Architecture of the University of Valladolid (ETSAVA) with ASFCyL, Castilla y León Association of Easy-to-Read ('Asociación de Lectura Fácil de Castilla y León'). A validation of some of the easy-to-read Spanish texts was made on June 8, 2023, which was attended by both LAB/PAP teachers involved in the aforementioned Research Project and students who were developing final degree projects related to inclusive design; it was attended by five validators of easy-to-read Spanish. Subsequently, a more exhaustive

validation of all the texts in easy-to-read Spanish was carried out independently. A final validation, this time of the entire virtual tour, was carried out on March 13, 2024; it was attended by four validators of easy-to-read Spanish. (Figure 15).

FIGURE 15. *Validation sessions at the Technical School of Architecture of the University of Valladolid (ETSAVA) with ASFCyL, Castilla y León Association of Easy-to-Read ('Asociación de Lectura Fácil de Castilla y León') on June 8, 2023, and on March 13, 2024.*

Source: Photographs by the authors, 2023, 2024.

During these validation sessions, several aspects that required special attention were highlighted, and the observations made by the validators were incorporated into the final design of the virtual tour: the design of the home screen, the way the floor plan and the language menu are displayed, the attention to line breaks within the easy-to-read Spanish texts, the glossary positioning and the choice of terms for it, the maximum simplification and color of the texts, and the background color of the information panels. These last two aspects are very relevant, since the original design for the information panels consisted of white texts and black background, to match the already established graphic image of the Museum and the generally dark atmosphere of its rooms, which is really immersive during the on-site visit. It was considered very important to transfer to the virtual space the identity and the feeling that the physical space provokes. However, this design is changed to black texts and white background when the information is in easy-to-read Spanish, since the validators considered that it was easier to read and understand the information with this combination of colors, something that is also indicated by the easy-to-read standards, prioritizing, therefore, the accessibility. This is the reason why all the icons are also black elements inside white circles, in addition to the fact that an inverse use of the colors in them would make their visibility, and consequently, accessibility, difficult, due to the aforementioned darkness of the Museum rooms.

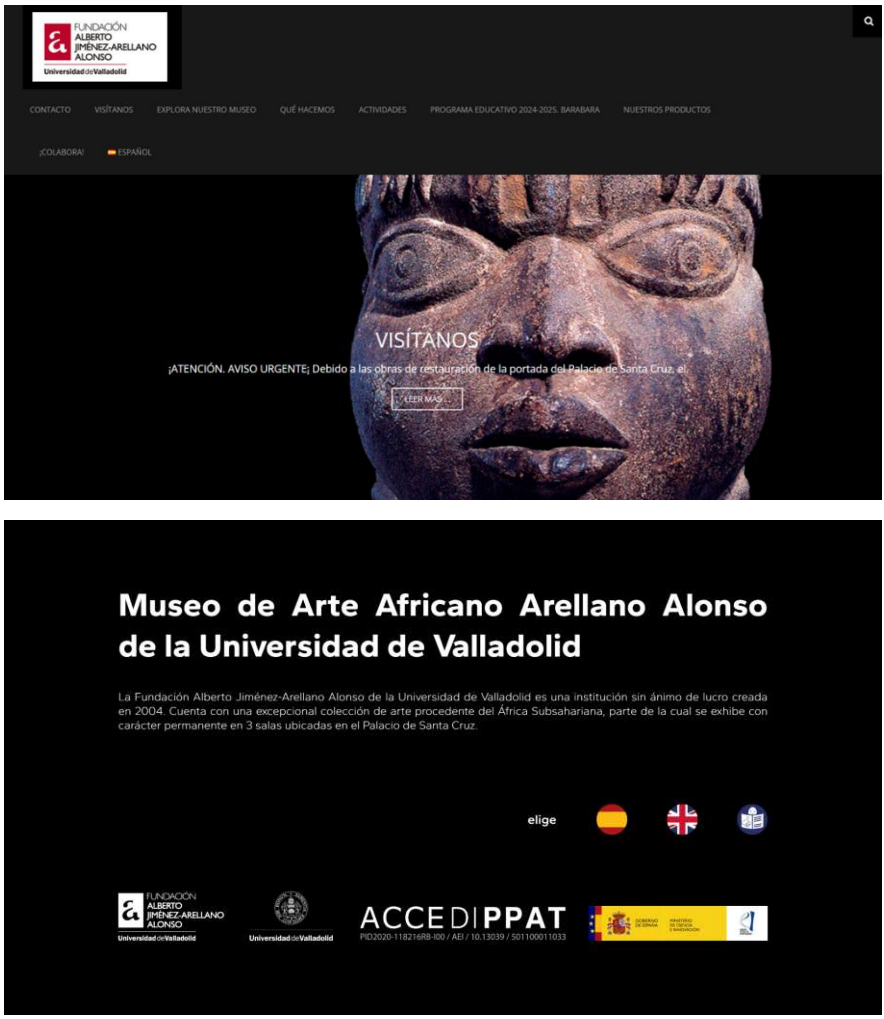
4. RESULTS AND DISCUSSION

Once the virtual tour was completed, it was uploaded to the Museum website (Figure 16), where it can be easily accessed by users (Fundación Alberto Jiménez-Arellano Alonso, n.d.) and, if desired, supplemented with additional information about the collections, activities, educational programs, etc. (Figure 17).

Access to information through the Internet is a reality for the majority of the population that has devices with electronic services. Millions of pieces of information are available online and can be accessed whenever and wherever (Lemos & Lévy, 2010, p. 23). Thus, users can visit the Museum at any time and from any location through a virtual tour,

using an Internet connection and an electronic device with a screen (smartphone, computer, tablet, etc.).

FIGURE 16. *Screenshot of University of Valladolid's Arellano Alonso Museum of African Art website that shows where users can access the virtual tour and screenshot of the home screen of the virtual tour*



Source: Screenshots by the authors, 2024.

For some time now, there have been concerns about whether museums that are available online in any form (through a virtual tour, a virtual collection, a website, etc.) may contribute to a decline in interest in physical museums for some users, but as Silva de Macedo and Mantelli Cozz (2005, p. 237) note after conducting a study on the advantages and disadvantages of virtual museums, it is generally the opposite. A tool like a virtual tour contributes to increasing the number of visitors, encouraging them to visit the museums in person and to gaining a deeper appreciation of the works housed in the institutions, just as other technologies such as television, magazines, etc. also contribute to increasing the interest of people in the pieces on display. The findings of a study done by Chekembayeva and Garaus (2024, p. 952) on the effects of virtual tours on users also suggest that the curiosity about museums motivates users to make an on-site tour after experiencing a virtual tour.

In addition, visitors are becoming more accustomed to having available both physical and virtual tools when visiting museums, or even a combination of them. Anita et al. (2021) show in their study the factors influencing public acceptance of virtual tours in museums and evaluate their influence on smart tourism, which works with the dimensions of informativeness, accessibility, interactivity and personalization (Lee et al., 2017).

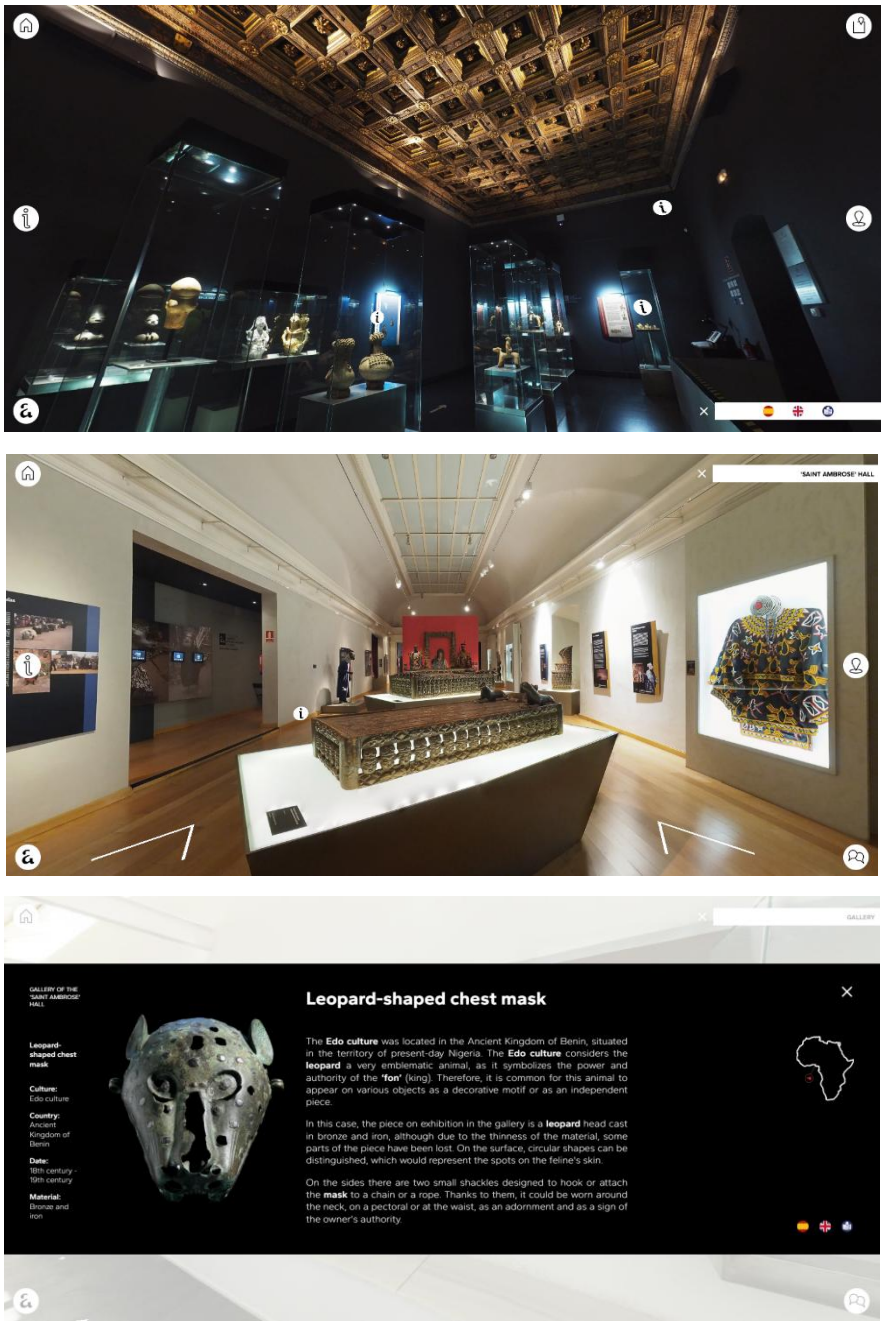
The introduction of virtual technologies makes it possible to approach the object on display and investigate it through digital environments, images and products, and to obtain details about them with a certain degree of interactivity (Ropelatto et al., 2015, p. 94). Undoubtedly, there is a different perception of the scale of an object (or a space) when its image is shown virtually or physically. Some factors that influence this perception are the size of the surface on which it appears, the dimensions of the image in relation to such surface, the colors of the image, etc.

According to Aumont (2002, p. 140), the size of the image is therefore one of the fundamental elements that determine and specify the relationship that the viewer will be able to establish between their own space and the plastic space of the image. However, much of the content presented in museums consists of static images. Even during a physical visit, conservation regulations or other visitors limit the possibility of approaching the pieces or doing it for a long period of time, which

sometimes prevents users from entirely appreciating them. With the support of advanced technology, details beyond what is visible to the naked eye can be captured, and nowadays it is possible to maintain image quality by increasing the number of pixels, which allows users to see certain parts of the images of the pieces on a bigger scale, and therefore, appreciate tiny details of said pieces. 'Virtual tours provide an opportunity to zoom the artifacts close enough to reveal the unusual techniques and textures used, which could further spark interest in observing the artifact in real life' (Chekembayeva & Garaus, 2024, p. 952).

The Museum has a space called 'Allowed to touch, you need to feel' with 1:1 scale reproductions of some of the pieces that can be touched, making the collection more accessible, especially to users with visual impairment. Nevertheless, in most museums there are not reproductions available and exhibits cannot be touched, which prevents users from appreciating minute details. In this sense, technology can generate greater differentiation, as it allows for greater attraction and interaction, offering new experiences (Ropelatto et al., 2015, p. 96).

FIGURE 17. *Screenshots of the virtual tour of University of Valladolid's Arellano Alonso Museum of African Art.*



Source: Screenshots by the authors, 2024.

5. CONCLUSION

The virtual tour of the University of Valladolid's Arellano Alonso Museum of African Art is a very useful tool that allows users to visit the Museum at any time, from any place, for as long as they wish, providing accessible and understandable information in Spanish, English and easy-to-read Spanish about the exhibits, and making the collections and the Museum accessible to as many users as possible; especially to those who cannot visit it because of geographical location, while also allowing users with physical disabilities to visit certain areas of the Museum that are inaccessible in any other way, due to the presence of stairs as the only access route to them.

It is a different experience to a physical visit, not a replacement for it, and although it can be used as a complement to it, it is conceived as a virtual visit on its own. In addition, it allows users who want to visit the Museum to anticipate and plan the visit in advance, as well as to those who have already visited it, to do it again in a different way, study the information and even delve deeper into various topics.

It is proposed, as a future line of continuity that the Museum management could adopt, to 3D scan the pieces that already appear in the information panels and include their 3D models in the described virtual tour, so that users can explore and understand them in their full volume, serving also as a complement to the 2D static images currently offered. In the future, it would also be positive to add information in more languages, including in easy-to-read in other languages, as well as in audio format.

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