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Interactive Design and Implementation of a Digital Museum under the Background of AR and Blockchain Technology

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Abstract: A museum is the destination of the crystallization of history and culture, and a museum is the center for the development of heritage culture. The display and exhibition of historical relics can promote the harmonious development of society. However, there are many defects in traditional museums. The collection in the museum is scattered. The exhibition needs a specific time and place to open, and the exhibition mode is boring and lacks entertainment, which seriously limits the museum's dissemination of history and culture. In order to improve the public's number of visits, museums need to keep pace with the times. Using augmented reality technology can digitize the information in the museum and integrate it with the user's real environment, which solves the limitation of time and space for most users to visit the museum, and greatly increases the entertainment of users to visit the museum. In addition, the application of blockchain technology in digital museums can effectively ensure the security of museum cultural relics data and quickly restore the lost cultural relics information. The digital museum can help tourists realize cross-region viewing. Through multimedia software and hardware, it can greatly stimulate tourists' interest and attract tourists of different ages to visit. This article uses digital technology to present physical museums in a digital form on the network, but it is difficult for digital museums to conduct targeted analysis on tourists of different ages. This article will analyze the attraction ability of digital museums to tourists of different ages, thereby attracting tourists of different ages to visit. This paper compared traditional museums with digital museums based on augmented reality technology and blockchain technology. The experimental results showed that from the perspective of young people, the average interactivity of traditional museums and digital museums was 47.20% and 78.20%, respectively; from the perspective of the elderly, the average interactivity of traditional museums and digital museums was 59.04% and 70.36%, respectively. Therefore, the digital museum built by using augmented reality technology and blockchain technology can effectively improve the interaction with users. The digital museum can improve the interaction with tourists of different ages, attract a large number of tourists for virtual visits, and improve the cultural transmission and economic development of the digital museum.

Keywords: digital museum; interaction design; augmented reality; blockchain technology

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1. Introduction

After a long historical evolution, humankind has achieved today's rich and colorful culture. The recording and inheritance of culture is the wisdom crystallization of social development. As a cultural service place that is open to the outside world and has the function of education and guidance, museums are the main place to preserve and disseminate culture. However, with the improvement of people's demand for cultural experience, the monotonous display of traditional museums has obvious defects. People often need to spend a lot of time visiting museums, and because they are not familiar with the contents of museums, people usually visit at random, which is very detrimental to the spread of culture. The number of exhibits displayed in a single museum is relatively small. If people want

to visit more exhibits, they need to visit multiple museums, which is very inconvenient. With the development of mobile information technology, augmented reality technology can achieve a real-time interactive and entertaining virtual reality environment through the use of multimedia and three-dimensional modeling. The development of information technology can realize the transformation from traditional museums to digital museums. In digital museums, people can interact with the museum system, improve people's interest in museums through augmented reality technology, and improve the effect of museum culture transmission. Therefore, this paper has research significance.

With the continuous development of intelligent technology, the traditional single museum experience mode has obvious limitations. Digital museums have broken the limits of time and space, and many people have studied digital museums. Among them, Mason Marco used 3D digital display technology to build a post-digital museum. Through comparison with traditional museums, it was found that the digital museum has stronger interaction with people, and tourists can reflect 3D animation elements in the digital museum [1]. Navarrete Trilce combined digital technology with heritage museums, so that heritage culture in museums can be transmitted in digital form, and can promote more people to join in heritage culture tourism while improving the transmission effect of heritage culture [2]. Zollo Lamberto can make the original museum have the characteristics of digital innovation and virtual environment by introducing Internet communication technology into the museum, and improve the competitive advantage of the museum and its attraction to tourists [3]. Stichelbaut Birger used digital technology to transform the museum and comprehensively display the heritage culture of World War I. Through multimedia technology, people's experience of heritage in the digital museum can be more vivid [4]. The digital museum is the result of the development of modern science and technology. Through multimedia technology, heritage and cultural materials can be displayed in more diversified forms, and the interaction between tourists and museums can be improved.

With the development of the Internet of Things, augmented reality technology can skillfully combine the virtual world and the real world. Relevant researchers have applied augmented reality technology to the interactive design of digital museums. Among them, Arrigoni Gabriella has improved the children's culture museum through augmented reality, so that children can more independently carry out open learning culture in the digital museum [5]. Carci Giuseppe applied augmented reality technology to the digital museum, which can stimulate people's emotional participation through human–computer interaction while transferring cultural knowledge to people [6]. Moorhouse Natasha combined augmented reality applications with museums, and students can use diverse digital technologies to acquire cultural knowledge. Through the survey of 19 children's use experience of digital museums, digital museums promote students' interest in learning [7]. Augmented reality and other technologies are used in museums to improve the interactive ability of digital museums and tourists and improve the ability of tourists to learn culture in a virtual and realistic environment, but there is a lack of comparison between traditional museums and digital museums with augmented reality technology.

Museums are important places for cultural transmission and cultural protection. The transformation from traditional museums to digital museums can provide people with more ways of cultural transmission [8]. This paper uses augmented reality technology to improve the museum. Through the combination of virtual scene and reality, people can feel cultural information through the super sensory experience and use blockchain technology to digitally store museum collections to promote the development of virtual culture in digital museums. This article uses augmented reality and blockchain technology to design digital museums, providing targeted visiting experiences for users of different ages through virtual digital scenes and improving the entertainment of digital museums.

2. Interactive Design Method of Digital Museum

Cultural relics are the epitome of historical development and the carrier of cultural transmission and development. Human ancestors have left most of the historical and cultural heritage in the long river of history. The protection and learning of cultural relics is an important way to spread culture and promote social development. In today's society, cultural relics are mainly collected through the construction of museums, and cultural relics can be spread in the process of exhibition. The opening of museums is very important for people to establish confidence and respect for cultural traditions. People can feel the development of history through culture [9,10].

However, there are many disadvantages in the management and operation mode of traditional museums. The opening of museums is offline exhibition, which requires visitors to spend a lot of time and energy to go to the site for exhibition, and the visiting process is very inconvenient [11,12]. In addition, the collection management of the museum is manual. First, the limited cultural relics collection of a single museum cannot bring comprehensive cultural education to the audience. Second, it is difficult for people to find the cultural relics they want to visit from the museum. The traditional museum visit mode is shown in Figure 1.

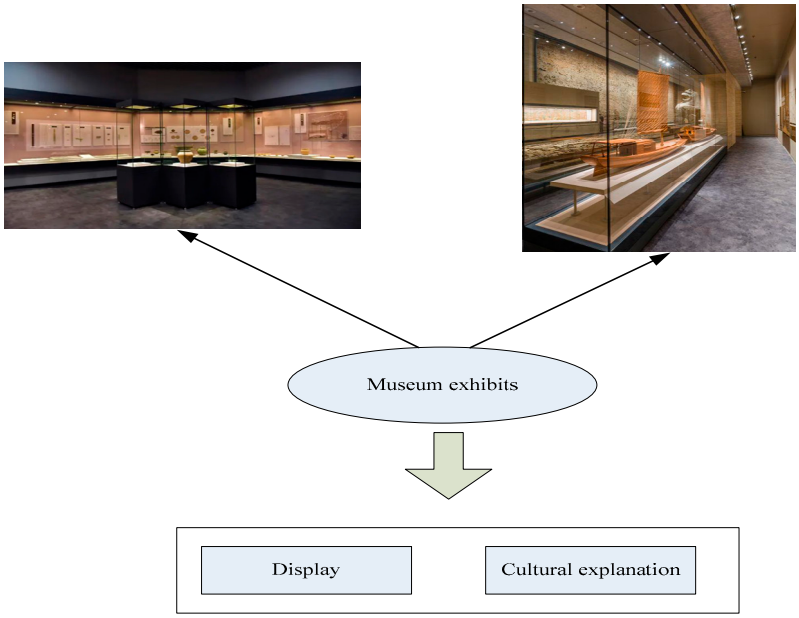


Figure 1. Traditional museum visiting mode.

In Figure 1, the traditional museum visiting mode is described. There are two modes for tourists to visit the traditional museum. One is to enjoy and learn the exhibits on display by themselves, and the other is to explain the culture through the museum management personnel.

With the improvement of people's living standards, the way of sightseeing tour has been gradually abandoned by people, and people's demand for museum experience has become diversified [13,14]. The digital museum converts cultural heritage into binary digits through various information technologies and digitizes museum exhibits through computer technology so that people can exchange information with the museum without the constraints of time and space [15,16].

2.1. Augmented Reality Technology

The Internet of Things collects information about objects through various information sensors, radio frequency identification, and other technologies, and realizes information exchange between objects or between objects and people with the help of the Internet [17]. Through the Internet of Things technology, the cultural exhibits, venue environment and

intelligent equipment in the museum can be connected, and the museum information can be transformed digitally, so that people can quickly view the museum relics.

Augmented reality technology is a branch of the Internet of Things, which is essentially a vision-based Internet of Things. Augmented reality can conduct virtual simulation of computer information, including image, video, text, and other information, and integrate virtual information with real scenes by using multimedia, 3D modeling, and intelligent sensing technologies [18,19].

Augmented reality technology performs an important role in digital museums, which is conducive to the promotion and dissemination of cultural heritage. The process of applying augmented reality technology to digital museums is shown in Figure 2.

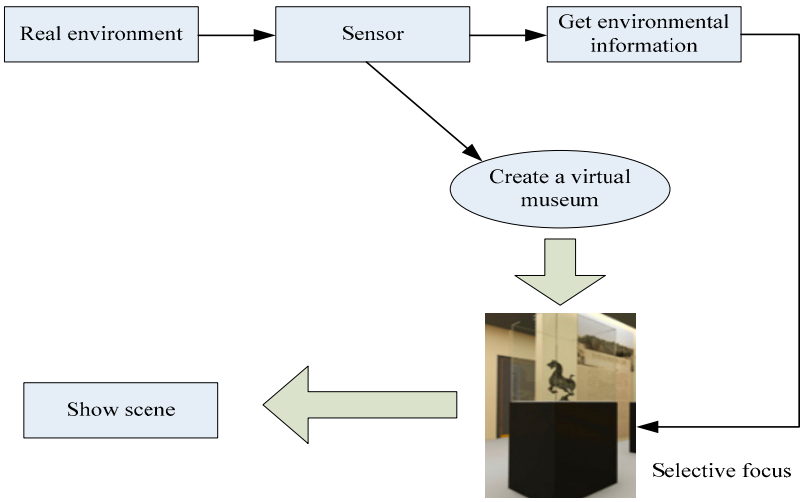


Figure 2. The process of applying augmented reality technology to digital museums.

In Figure 2, the process of applying augmented reality technology to the digital museum is described. The audience obtains the current environmental information in the real environment through sensory devices, such as mobile phones. According to the information received by the sensor, the virtual museum object can be constructed, and the virtual museum object can be combined with the real environment, so that the audience can interact with the museum.

Applying augmented reality technology to digital museums can combine virtual museum objects with real environments and display them through intelligent devices. The digital museum applying augmented reality technology has the following characteristics: users can interact with the virtual and real environment in real time, use intelligent devices or adjust the camera angle to obtain different synthetic scenes, and improve the interaction between users and the museum. The scene synthesized by augmented reality technology is a three-dimensional matching mode, which can accurately overlap the museum exhibit information with the real environment, so that users can be in the scene.

The integration of digital technology and traditional museums can improve the transmission effect of heritage culture, and the combination of augmented reality technology and museums can provide users with real-time interactive appreciation methods, helping users to understand heritage culture more systematically. It is the core of the whole technology to accurately combine the virtual museum exhibits with the real environment in the augmented reality technology. It is necessary to convert the coordinates of the virtual objects with the camera coordinates and pixel coordinates.

If the user's world coordinate in the real scene is $(X_a, Y_a, Z_a, 1)$, the camera coordinate of the point is $(X_b, Y_b, Z_b, 1)$. The image coordinate obtained by the camera is $(X_k, Y_k, 1)$, then the conversion process from world coordinate to camera coordinate is:

$$\begin{bmatrix} X_b \\ Y_b \\ Z_b \\ 1 \end{bmatrix} = D \begin{bmatrix} X_a \\ Y_a \\ Z_a \\ 1 \end{bmatrix} \tag{1}$$

In Formula (1), D represents the camera external parameter matrix.

The conversion process from camera coordinates to image coordinates is as follows:

$$Z_b \begin{bmatrix} X_k \\ Y_k \\ 1 \end{bmatrix} = \begin{bmatrix} u & 0 & 0 & 0 \\ 0 & u & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} X_b \\ Y_b \\ Z_b \\ 1 \end{bmatrix} \tag{2}$$

In Formula (2), u represents the focal length of the camera. Since the pixel description is used for the imaging of virtual museum exhibits, the image coordinates are converted into pixel coordinates to obtain:

$$\begin{bmatrix} e \\ f \\ 1 \end{bmatrix} = E \begin{bmatrix} X_k \\ Y_k \\ 1 \end{bmatrix} \tag{3}$$

In Formula (3), E is the pixel coordinate conversion parameter.

Then, the conversion formula from camera coordinates to pixel coordinates is:

$$Z_b \begin{bmatrix} e \\ f \\ 1 \end{bmatrix} = M \begin{bmatrix} X_b \\ Y_b \\ Z_b \\ 1 \end{bmatrix} \tag{4}$$

In Formula (4), M represents the camera's internal parameter matrix.

2.2. Blockchain Technology

Blockchain technology is to form a chain of multiple block spaces and combine them in chronological order. The information of each chain is stored on the server. Blockchain technology can provide information security for the overall system [20,21]. With the development of a new round of information technology, the combination of blockchain technology and augmented reality is becoming increasingly closer, and the data security attributes of blockchain are also applied in various fields.

Due to its special structure, the blockchain has the characteristics of decentralization. There is no central control system in the blockchain system. All nodes store a large amount of information, which is a distributed storage structure. It has high security. As each node cannot tamper with data and the information change of each node is transparent, this ensures the security of system data [22]. Blockchain can be well applied to digital museums and expand the functions of digital museums. The application of blockchain in digital museums is shown in Figure 3.

In Figure 3, the application of blockchain in digital museums is described. Through blockchain technology, data in museums can be permanently saved, and cultural relics can be connected with users in the form of digital collections.

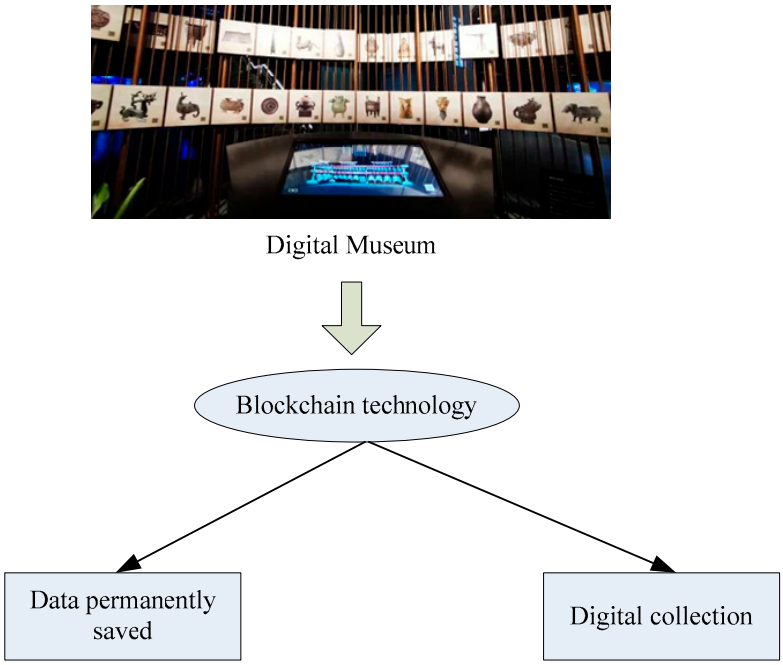


Figure 3. Application of blockchain in digital museum.

Due to the result of decentralization, blockchain has extremely high data security. By using blockchain to store the cultural relics information in the museum, the original can be highly restored. For example, in 2018, the National Museum of Brazil caught fire, and only 10% of the 20 million cultural relics in its collection survived, causing huge losses. The electronic panorama of the National Museum of Brazil can be viewed by using blockchain technology, and the damaged cultural relics can also be repaired according to detailed information later.

Applying the uniqueness of blockchain to digital museums can design equivalent digital collections, including cultural relics images, videos, and certificates, which can promote people's communication with digital museums. The digital collections of museums would also be permanently stored in the blockchain system. They can be issued, purchased, and used. Relevant records would also be saved.

2.3. Interactive Design of Digital Museum

Due to the non-renewable nature of cultural heritage, it is important to protect and actively spread cultural heritage. The digital museum can transform the cultural relics in the museum into digital information through augmented reality technology and blockchain technology, and can interact with users through intelligent technology to improve the information transmission ability of cultural heritage [23,24].

The interactive design model of digital museum is shown in Figure 4.

In Figure 4, the model of digital museum interaction design is described. Through information technology, the digital museum can interact with each user, and there is also information interaction between each user.

With the help of Internet technology, digital museums can rapidly spread cultural heritage information [25,26]. Through intelligent technology, people can provide diversified ways of transmission of heritage culture to meet people's needs for cultural heritage acquisition. Common interactive design methods for digital museums are as follows.

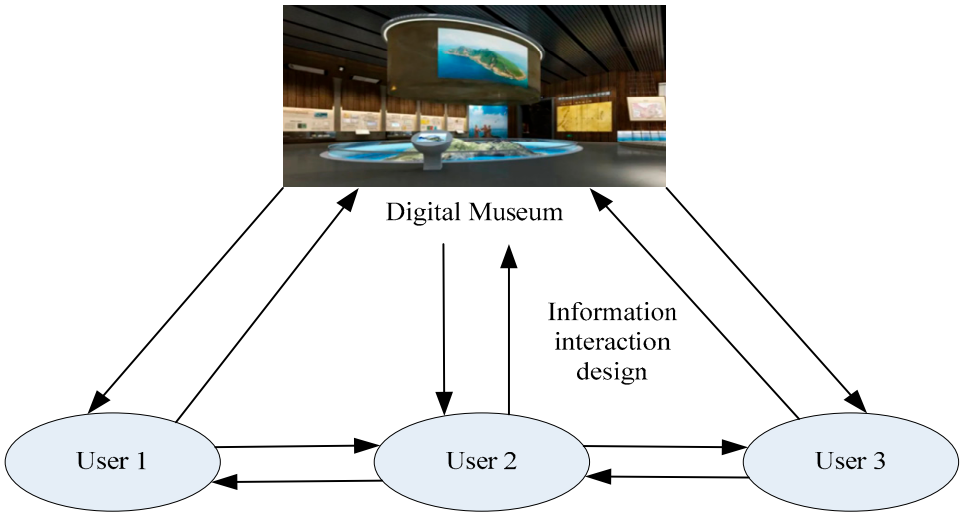


Figure 4. Model diagram of interactive design of digital museum.

It is necessary to establish a digital museum website and use multimedia technology to digitize all aspects of information in the museum, including the museum's historical development, heritage, and cultural activities [27,28]. With the support of augmented reality technology, users can combine the digital model in the museum with the real environment, and users can observe the cultural relics in a close distance, and can adjust the model in the digital museum through terminal equipment.

Augmented reality technology is widely used in digital museums. Users can experience virtual interaction and services according to their real geographical location in the museum scene of virtual and real combination, and guide users to reach the target location and the best route smoothly by planning a reasonable tour route. According to the real-time positioning of users, cultural relics can be explained. The interaction ability between users and virtual museum cultural relics can be improved, and the entertainment of users in the digital museum can be increased.

3. Experiment of Interactive Design of Digital Museum

3.1. Data Source of Digital Museum

With the development of information technology and the need of society to spread historical heritage culture, the transformation from traditional museums to digital museums is inevitable. The digital museum presents the contents of the museum completely to the network through information technology, abandons the disadvantages of many traditional museums, and promotes the information exchange between users and museums [29,30].

The core of digital museum is to interact with users. In order to fully obtain the interactive functions of digital museum expected by users, this paper randomly selected 500 people from the National Palace Museum of China in 2019, mainly investigating the interactive digital museum functions expected by tourists. A total of three open questions and two closed questions were put forward to make statistics on the proportion of the number of questions investigated, but the results of the questionnaire survey have strong subjective factors. The survey results of interactive digital museum functions expected by users were shown in Table 1.

Table 1. Interactive digital museum functions expected by users.

Serial Number	Function	Number of People	Proportion
1	Animation displays of cultural relics	85	17%
2	Interactive games	130	26%
3	Realistic tour	90	18%
4	Picture and text introduction	75	15%
5	Virtual contact with cultural relics	120	24%

In Table 1, the interactive digital museum functions expected by users were described, and a total of five functions expected by users were counted. Among them, the interactive small game function accounted for the highest proportion of 26%, the virtual contact cultural relics function accounted for 24%, and the image and text introduction function accounted for the lowest proportion of 15%. The functions of these five surveys had a high proportion, indicating that users were more expected to interact with cultural relics in digital museums and increase the sense of entertainment through interactive games.

Digital museums use information technology to improve the dissemination of heritage culture. This paper used augmented reality technology to combine virtual cultural objects with the real world and used blockchain technology to ensure the security of digital museum information. In order to effectively analyze the interactive design effect of digital museums, this paper made a questionnaire survey of 200 museum propagandists, mainly analyzing the indicators they thought can evaluate the interactive design effect of digital museums, the 200 museum propagandists surveyed are different from 500 randomly selected tourists. The form of the questionnaire is an open questionnaire. Museum propagandists have a clear understanding of the characteristics of tourists' visits, and the interactive design indicators answered have a good reference basis. The evaluation indicators of interaction design effect of digital museum were shown in Table 2.

Table 2. Evaluation indicators of interactive design effect of digital museum.

Serial Number	Evaluating Indicator	Number of People	Percentage
1	Interactivity	64	32%
2	Entertainment	56	28%
3	Sense of experience	44	22%
4	Content richness	36	18%

Table 2 describes the evaluation indicators of the interactive design effect of digital museums. A total of four indicators were counted, of which the highest percentage of interactive indicators was 32%; the entertainment indicators were 28%; the content richness indicators were at least 18%.

3.2. Experimental Design of Digital Museum Interaction

A museum is an important carrier of cultural communication and performs a key role in social development and public education. This paper used augmented reality technology and blockchain technology to build a digital museum. In order to analyze the cultural transmission effect of the digital museum, this paper analyzed the performance of the digital museum by setting up a control group. Among them, the control group was a traditional museum, which mainly carried out cultural transmission in the form of cultural relics display. The experimental group was a digital museum based on augmented reality technology and blockchain technology. Digital museums enhance their attraction to tourists through interactive design. The indicators of interactive design for digital museums are the

results of Table 2. Therefore, it is possible to compare and analyze the interactive effects of digital museums through experiments.

This paper selected two museums in Beijing, China. The scale and fame of the two museums had little difference. Museum A adopted the traditional display mode, while Museum B adopted the digital museum mode. The two museums (A and B) are separately selected in China for experimental data analysis only. The experiment lasted for a total of five months, and the tourists' real evaluations of the two types of museums were counted. The tourists did not know about the experiment in advance, and the statistical results were obtained after the experiment. As tourists of different ages had different levels of acceptance of digital museums, this paper would conduct data statistics on young and old people, respectively, the age range of young people was 18–30 years old, and the age range of older people was 55–75 years old. By analyzing the impact of digital museums on tourists of different ages, personalized digital museum content can be recommended for tourists of different ages, for example, more entertainment and interactivity can be added for young people. According to the characteristics of tourists of different ages, museum publicity can stimulate more tourists to visit.

4. Interactive Results of Digital Museum

4.1. Interactive Comparison

Interaction refers to the degree of interaction between museum cultural transmission and tourists. The interaction between museums and tourists is conducive to cultural transmission. The interaction of traditional museums is mainly through the interpretation of cultural relics by the lecturer, while the interaction of digital museums is diverse. The interactive comparison between traditional museums and digital museums based on augmented reality technology and blockchain technology is shown in Figure 5.

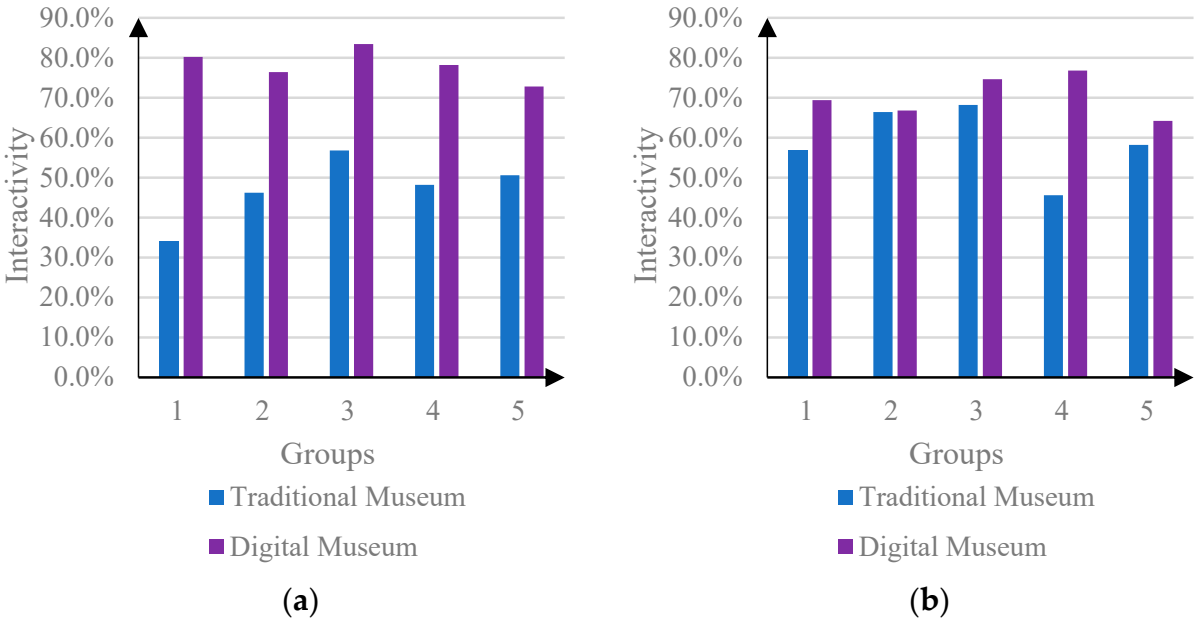


Figure 5. Interactive comparison results. (**a**) Interactivity of museums from the perspective of young people, (**b**) Interactivity of museums from the perspective of the elderly.

In Figure 5a, the interactivity comparison results of the two museums from the perspective of young people were described. The interactivity of traditional museums reached the lowest of 34.2% in the first group and the highest of 56.8% in the third group, with an average interactivity of 47.20%. The interactivity of digital museums based on augmented reality technology and blockchain technology reached a minimum of 72.8% in the fifth group and a maximum of 83.4% in the third group, with an average interactivity of 78.20%. In Figure 5b, the interactivity comparison results of the two kinds of museums from the

perspective of the elderly were described. The interactivity of traditional museums reached the lowest of 45.6% in the fourth group and the highest of 68.2% in the third group, with an average interactivity of 59.04%. The interactivity of digital museums based on augmented reality technology and blockchain technology reached a minimum of 64.2% in the fifth group and a maximum of 76.8% in the fourth group, with an average interactivity of 70.36%. The overall effect of the interactivity of digital museums was higher than that of traditional museums. However, by comparing the interaction experience of young people and the elderly, the interactivity between digital museums and young people was higher, mainly because the elderly's acceptance of information technology was weaker than that of young people. Therefore, digital museums built using augmented reality technology and blockchain technology had higher interactivity.

4.2. Entertainment Comparison

Entertainment is also an indicator that tourists pay great attention to when visiting museums. It is difficult for tourists to resonate with cultural relics in the dull way of museum browsing. The entertainment comparison between traditional museums and digital museums based on augmented reality technology and blockchain technology is shown in Figure 6.

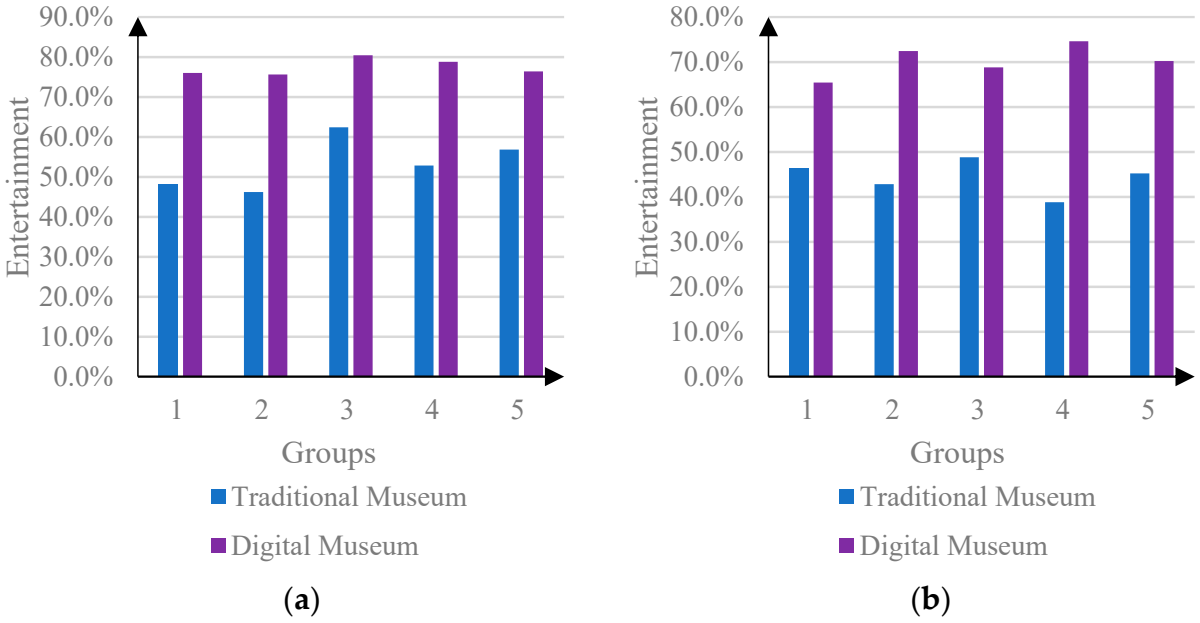


Figure 6. Entertainment comparison results. (**a**) Amusement of museums from the perspective of young people, (**b**) Amusement of museums from the perspective of the elderly.

In Figure 6a, the comparison results of the entertainment of the two museums from the perspective of young people are described. The entertainment of traditional museums reached the lowest of 46.2% in the second group and the highest of 62.4% in the third group, and the average entertainment was 53.28%. The entertainment of digital museums based on augmented reality technology and blockchain technology reached a minimum of 75.6% in the second group and a maximum of 80.4% in the third group, with an average entertainment of 77.44%. The entertainment of digital museums was higher than that of traditional digital museums in five experimental groups. In Figure 6b, the entertainment comparison results of the two kinds of museums from the perspective of the elderly were described. The entertainment of traditional museums reached the lowest of 38.8% in the fourth group and the highest of 48.8% in the third group, and the average entertainment was 44.4%. The entertainment of digital museums based on augmented reality technology and blockchain technology reached a minimum of 65.4% in the first group and a maximum of 74.6% in the fourth group, with an average entertainment of 70.28%. Therefore, digital

museums that combined virtual museum artifacts with real scenes using augmented reality technology had higher entertainment effects.

4.3. Comparison of Experience

The sense of experience refers to the comprehensive experience of visitors when visiting the museum. There are many factors that affect the sense of experience, such as the requirements of the museum for tourists to visit time and place, and the intelligent service of the museum. Traditional museums and digital museums based on augmented reality technology and blockchain technology were compared in terms of experience, and the comparison results were shown in Figure 7.

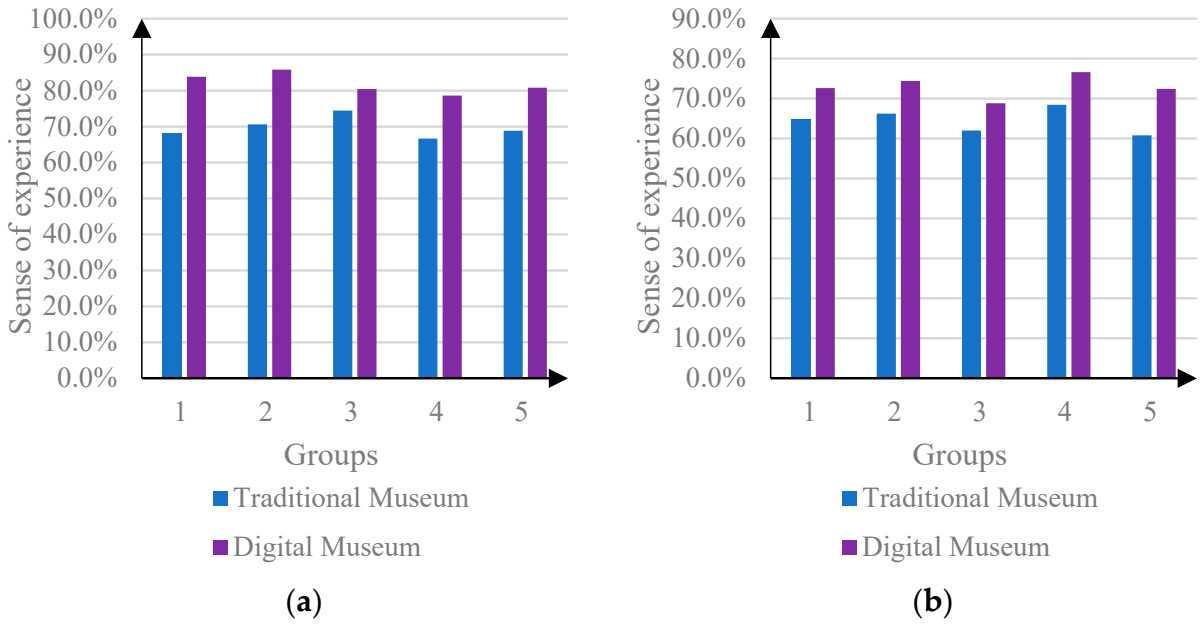


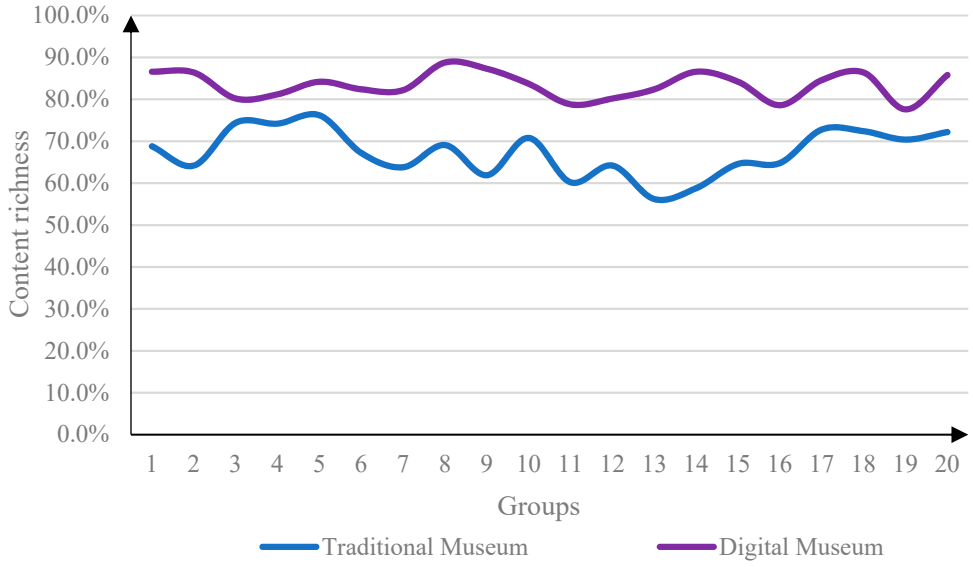
Figure 7. Comparison results of sense of experience. (**a**) Young people's experience of museums (**b**) Older people's experience of museums.

In Figure 7a, the comparison results of young people's experience of two kinds of museums are described. Young people's experience of traditional museums reached the lowest of 66.6% in the fourth group and the highest of 74.4% in the third group, and the average experience was 69.72%. Young people's experience of digital museums based on augmented reality technology and blockchain technology reached a minimum of 78.6% in the fourth group and a maximum of 85.8% in the second group, with an average experience of 81.88%. The reason why young people's experience of digital museums was higher than that of traditional museums was that digital museums can provide users with diversified services and promote information exchange between users and digital museums. In Figure 7b, the comparison results of the elderly's sense of experience of the two museums are described. The elderly's sense of experience of traditional museums reached the lowest of 62.0% in the third group and the highest of 68.4% in the fourth group, and the average sense of experience was 64.44%. The elderly had a higher sense of experience of digital museums than traditional museums, and the average sense of experience of digital museums was 72.96%. Therefore, digital museums based on augmented reality technology and blockchain technology can effectively improve the experience of tourists.

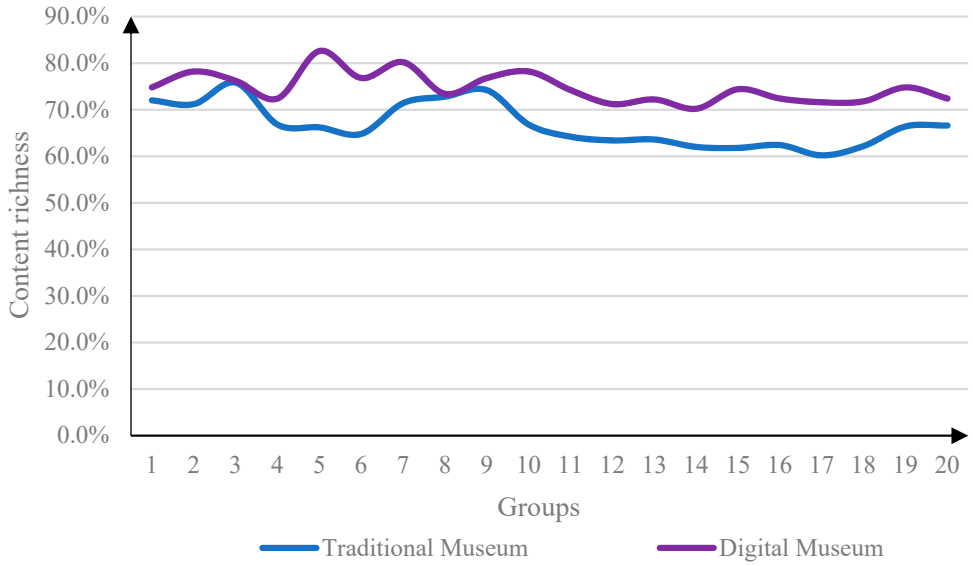
4.4. Content Richness Comparison

As an important base for heritage cultural transmission, museums should be as diverse as possible in their cultural transmission methods, and the content of cultural transmission should also be as rich as possible. The content richness of traditional museums and

digital museums based on augmented reality technology and blockchain technology was compared, and the comparison results were shown in Figure 8.



(**a**)



(**b**)

Figure 8. Comparison results of content richness. (**a**) The richness of museum content from the perspective of young people, (**b**) The richness of museum content from the perspective of the elderly.

In Figure 8a, the comparison results of the content richness of the two museums from the perspective of young people are described. The content richness of traditional museums reached the lowest 56.2% in Group 13 and the highest 76.2% in Group 5, and the average content richness was 67.36%. The content richness of digital museums based on augmented reality technology and blockchain technology reached a minimum of 77.6% in Group 19 and a maximum of 88.8% in Group 8, with an average content richness of 83.41%. The reason why the content of digital museums was more rich in the eyes of young people was that the cultural relics resources of digital museums were not limited by venues, and the online resources were rich. In Figure 8b, the comparison results of the

content richness of the two museums from the perspective of the elderly are described. The content richness of the traditional museums reached the lowest of 60.2% in Group 17 and the highest of 75.8% in Group 3, with an average content richness of 66.74%. The content richness of digital museums based on augmented reality technology and blockchain technology reached a minimum of 70.2% in Group 14 and a maximum of 82.6% in Group 5, with an average content richness of 74.74%. The reason why the content richness of digital museums from the perspective of the elderly was not very different from that of traditional museums was that the elderly were not skilled enough in using the digital museum system.

5. Discussions

The construction of digital museums can change the original functions of traditional museums. The construction of digital museums is not isolated from traditional museums, it is the deepening and expansion of traditional museums. The digital museum breaks away from the limitations of time and space of traditional museums: tourists can visit through the network without waiting for the museum to open and go to the site in person. The digital museum built by using augmented reality technology and blockchain technology in this paper can enhance the interactivity of tourists to the digital museum. This article analyzes the interactive impact of digital museums on young and elderly tourists by discussing tourists of different ages, and young people have a higher interactivity with digital museums. Therefore, targeted services for different age groups of tourists can more effectively improve the visitor experience. The use of information technology in digital museums has expanded the business scope of traditional museums and promoted cultural exchanges.

6. Conclusions

Cultural heritage is the accumulation of national spirit, and the promotion and dissemination of cultural heritage is conducive to social progress. The museum is the center of cultural heritage display, which is important for the dissemination of history and culture. However, the traditional museum carry out cultural transmission in the form of cultural relics display and exhibition, which is seriously affected by space, time, and other factors. The traditional museum is very able to meet the needs of people to visit. With the development of the Internet of Things technology, augmented reality technology improves the interaction between users and museums by digitally storing museum cultural relics and combining the constructed virtual cultural relics with the real world of users, and digital museums can also ensure the security of cultural relics information through blockchain technology. In this paper, augmented reality and other technologies are applied to museums, and digital museums are built to solve the problems of traditional museum information dispersion and separation from the era environment and improve the communication efficiency of museums. This paper compares traditional museums and digital museums. Through multiple experimental analysis, the results showed that digital museums applying augmented reality and blockchain technology can effectively improve the interaction between museums and tourists, and provide tourists with a sense of experience and entertainment. This paper builds a digital museum using augmented reality and blockchain technology. Through interactive design of the digital museum, it solves the restriction of traditional museums by time and space factors, and promotes tourists of different ages to visit the digital museum. Information technology, such as augmented reality, can enhance the communication ability between museums and the public. However, when analyzing the performance comparison of the two museums, this paper only analyzed the young and the elderly, and the population analyzed was not comprehensive enough. Therefore, the performance comparison of the two museums in adults will be the direction of future research.

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