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Exploration on Interactive Narrative Application of Museum Digital Exhibition under the Background of Digital Transformation

-- A Case Study of Hubei Provincial Museum

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Abstract: With the advancement of digital transformation, the interactive narrative of museum digital exhibitions has gradually become the key to the digital transformation of the museum field. People have also entered a period of significant change in the exhibition mode of modern museums. This study delves deeply into this topic, selecting Hubei Provincial Museum as the research object. The museum has created numerous excellent digital exhibitions through cutting - edge technologies such as virtual reality (VR) and 3D modeling and printing technology. These exhibitions adopt a multi - linear narrative approach, combined with interactive experience installations, which greatly enhance the audience's sense of participation and immersion. Meanwhile, the museum utilizes big data and artificial intelligence technology to optimize the tour service, providing personalized visiting suggestions for the audience, further enhancing the visiting experience, reconstructing the audience's visiting mode, and meeting the diversified needs of the audience for cultural experiences. These practices not only offer successful examples for the digital transformation of museums but also provide more inspiration for other museums in this regard. In the future, museums will need to continue exploring technological and content innovation to promote the sustainable development of interactive storytelling in digital exhibitions.

Keywords: Digital Transformation; Digital Exhibition; Interactive Narrative; Hubei Provincial Museum.

1. Introduction

1.1. Research Background and Significance

In the era of digital transformation, various industries are actively embracing digital technology to achieve innovative development and transformation and upgrading. As an important place for cultural inheritance and display, museums are inevitably impacted by the digital wave. With the rapid development of the Internet, multimedia, virtual reality and other technologies, the traditional exhibition mode of museums has gradually revealed its limitations, and the requirements of visitors for exhibition experience are increasing day by day, and they are no longer satisfied with the simple display of cultural relics and text descriptions. In this context, museum digital exhibition came into being and has become a new direction of museum development. Digital exhibition uses digital technology to present cultural relics to the audience in a more vivid, three-dimensional and diversified way, which greatly expands the space and time dimension of the exhibition. Through the application of interactive narrative, the audience can participate more deeply in the exhibition, interact with the exhibits and exhibition contents, and thus obtain a unique and rich visiting experience. This not only helps to enhance the attraction and influence of the museum but also opens new paths for cultural dissemination.

From the perspective of cultural communication, interactive narration of digital exhibitions breaks the time and space restrictions of traditional museum exhibitions and can spread cultural resources of museums to a wider audience with the help of platforms such as the Internet. People from different regions, different ages and different backgrounds can enjoy the rich cultural connotation through digital exhibitions and promote the diversified exchange and sharing of cultures. This plays an important role in promoting excellent traditional culture, enhancing national cultural confidence, and promoting the development of cultural industries.

1.2. Research Objectives and Methods

This study aims to deeply analyze the specific application methods, effects and challenges of interactive narrative in digital exhibitions of Hubei Provincial Museums under the background of digital transformation, and provide theoretical basis and practical guidance for museums to further optimize digital exhibitions, improve audience experience and promote cultural communication. Through exploring how to make more effective use of interactive narrative means to enhance the attraction, appeal and educational function of digital exhibitions, it is hoped to provide experience and model for other museums to use for reference in the process of digital construction. To achieve the above research objectives, this study adopts a variety of research methods. Through the literature research method, the author extensively consulted domestic and foreign academic literature, research reports, industry information and other materials on museum digitalization and digital exhibition interactive narration, sorted out relevant theoretical basis and research status, understood existing research achievements and shortcomings, and provided theoretical support and research ideas for subsequent research. This paper deeply analyzes the typical cases of digital exhibitions in Hubei Provincial Museum, makes a detailed analysis of its

interactive narrative design concept, technology application, narrative content, audience feedback and other aspects, and summarizes successful experiences and existing problems. At the same time, in combination with the field investigation method, I visited Hubei Provincial Museum in person to observe the actual display of the digital exhibition, conducted exchanges and interviews with museum staff and visitors, obtained first-hand information, intuitively felt the audience's visiting experience and needs, and provided more real and reliable data support for the research.

2. Relevant Theoretical Basis

2.1. Digital Transformation Theory

The concept of digital transformation [1] first arose in the business field, and with the rapid development of information technology, it has gradually penetrated into various industries. In the field of museums, digital transformation refers to the use of a new generation of digital technologies, such as cloud computing, big data, artificial intelligence, virtual reality, augmented reality, etc., to carry out comprehensive changes and innovations in the business processes, management models, service methods and exhibitions of museums, to meet the development needs of the digital era. Enhance the comprehensive competitiveness and social influence of museums.

From the perspective of connotation, the digital transformation of museums is not only the digital transplantation of traditional business, but a profound change involving all levels of museum operation and management. Driven by digital technology, it breaks the restrictions on the use of time, space and resources in traditional museums, and realizes the intelligence, efficiency and personalization of museum business. Through digital collection, storage and management of collection data, museums can more easily study, protect and utilize collections. With the help of big data analysis of the audience's behavior habits, interests and preferences, museums can provide more targeted services and exhibition content for the audience and achieve accurate cultural communication.

2.2. Interactive Narrative Theory of Digital Exhibition

Interactive narrative [2] is an emerging narrative method, which breaks the one-way and linear structure of traditional narrative with the help of the interactivity of digital technology, enabling the audience to deeply participate in the narrative process and become the co-creator of the story. In digital exhibitions, interactive narrative has a unique role and form of expression. From the perspective of function, interactive narratives can greatly enhance the audience's sense of participation and immersion. The traditional museum exhibition is mainly static display, the audience is in a passive state of receiving information, it is difficult to deeply understand the exhibition content. Through the design of various interactive links, such as touch screen, motion operation, voice command, etc., interactive narration enables the audience to actively explore the story behind the exhibits and enhances the emotional connection between the audience and the exhibition. In the digital exhibition of Hubei Provincial Museum, visitors can choose different perspectives of cultural relics interpretation through interactive installations and have a deep understanding of the historical background and production process of cultural relics according to their own interests, as if they are in a historical situation, and have a dialogue with cultural relics across time and space. This sense of participation and immersion can effectively enhance the audience's visiting experience and leave a deeper impression on the exhibition content.

Interactive narrative presents a variety of features in digital exhibitions. Among them, nonlinear narrative [3] is a more common form. Different from the traditional linear narrative, which unfolds in sequence according to the chronological order or the logic of the development of events, the non-linear narrative constructs a multi-threaded and multi-node narrative structure, and the audience can decide the development path and outcome of the story according to their own choices. Taking a digital exhibition in Hubei Provincial Museum as an example, the exhibition revolves around the history and culture of Chu. The audience can enter from different historical periods, different characters' stories or different cultural fields, and freely choose the order and content of the visit, to piece together their own historical cognition of Chu. This kind of narration gives the audience greater autonomy and satisfies the individual needs of different audiences.

3. The Application Status of Interactive Narrative in Museum Digital Exhibitions

3.1. Overview of the Development of Digital Exhibitions in Domestic and Foreign Museums

The development of digital exhibitions in foreign museums started earlier. In the 1960s, museums in some developed countries began to try to use computer technology for collection management and information storage. With continuous progress of technology, in the 1980s, the application of digital technology in museum exhibitions gradually expanded to the field of display, and some museums began to use multimedia technology to produce simple digital display content, such as audio guide and video introduction. In the 1990s, the popularity of the Internet ushered in new opportunities for the development of museum digital exhibitions. More and more museums established official websites, digitized part of the exhibition contents and uploaded them to the Internet, realizing the online dissemination of exhibitions. In 1997, the British Museum launched an online exhibition, allowing a global audience to enjoy the museum's valuable artifacts through the Internet. Since the 21st century, the rapid development of emerging technologies such as virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) has brought revolutionary changes to museum digital exhibitions. Many well-known foreign museums have increased their investment in digital exhibitions, using advanced technologies to create highly immersive and interactive digital exhibitions. The "Mona Lisa Smile" digital exhibition of the Louvre in France, through high-definition projection, 3D modeling and other technologies, so that the audience can enjoy the world's famous painting at close range and from multiple angles, but also the use of VR technology to reproduce the historical scene of the Louvre, so that the audience seems to travel through

time and space, personally feel the development of the Louvre. The "Art and Game" digital exhibition launched by the Metropolitan Museum of Art in the United States combines art works with interactive games, and the audience can participate in the game through mobile phones or tablets and have an in-depth understanding of the creation background and art style of art works during the game process, which greatly improves the audience's participation and learning interest.

The development of digital exhibitions in domestic museums is relatively late, but it has developed rapidly in recent years. In the late 1990s, with the advancement of domestic information construction, some museums began to explore digital development paths, mainly focusing on the digital management of collections [4]. In the 21st century, domestic museums gradually realized the importance of digital exhibitions in cultural communication and audience service and have begun to increase their research and development and investment in digital exhibitions. In 2008, the National Museum of China launched the first digital exhibition "Art of Ancient Chinese Bronzes", which introduced the development history and artistic characteristics of ancient Chinese bronzes to the audience through the display of pictures and pictures [5].

Fig 1. The digital house model in the Three Gorges digital Exhibition forever
(Credit: Photo taken by the author)

4. Case Study of Digital Exhibition in Hubei Provincial Museum

4.1. Overview of Digital Development of Hubei Provincial Museum

Hubei Provincial Museum, as the largest comprehensive museum with the richest collection in Hubei Province, has been actively following the trend of digital transformation and vigorously promoting digital construction. In the past few years, Hubei Provincial Museum has invested a lot of human, material and financial resources in the research and development and application of digital technology and has achieved remarkable results. In terms of digital infrastructure construction, Hubei Provincial Museum has continuously improved the network environment in the museum, achieved wireless network coverage throughout the museum, and provided convenient Internet access conditions for visitors. Advanced hardware facilities such as servers and storage devices are introduced to ensure the stable operation of digital services. The construction of digital security protection system has been strengthened, and measures such as multiple encryption technologies and firewalls have been adopted to ensure the security of the museum's digital resources and visitors' information. In terms of collection digitization, Hubei Provincial Museum has digitally collected and stored many precious cultural relics in the museum. Through high-definition photography, three-dimensional scanning and other technical means, the appearance, texture and details of cultural relics are recorded in an all-round way, forming a detailed digital archive of cultural relics. These digital archives not only provide an important basis for the research, protection and restoration of cultural relics, but also provide rich materials for the planning and production of digital exhibitions. Up to now, the Hubei Provincial Museum has completed the digitization of thousands of cultural relics, including a few cultural relics with important historical value and cultural influence, such as Zeng Hou Yi chime bells and King Yue Gou Jian sword. In terms of digital exhibitions, Hubei Provincial Museum has achieved fruitful results. In recent years, several innovative and influential digital exhibitions have been launched, such as the digital exhibition of "King of Yue Gou Jian Sword, Zeng Hou Yi Chime bell theme immersive VR" and "Forever Three Gorges - Three Gorges Cultural Relics Protection and Utilization Digital Exhibition". These digital exhibitions make full use of virtual reality, augmented reality, multimedia interaction and other technologies to display cultural relics and history and culture in a vivid, three-dimensional and interactive way, attracting the attention and participation of many visitors. Through continuous innovation and practice, Hubei Provincial Museum has gradually formed its own characteristics and advantages in the interactive narrative design, technology application and audience service of digital exhibitions, and has become one of the models for the digital development of domestic museums.

4.2. Inspiration from Interactive Narrative Practice of Digital Exhibition in Hubei Provincial Museum

1) Technological innovation and application improvement, keep up with the pace of The Times: The technological innovation and application of Hubei Provincial Museum in the field of interactive narration of digital exhibitions have significantly improved the visitors' interactivity and immersion, and provided a newer visiting experience. Through a combination of cutting-edge technologies such as virtual reality (VR), digital audio synthesis and touch interaction, 3D modeling and printing, and artificial intelligence, the museum has not only enriched the exhibition content, but also greatly enhanced the audience's engagement and exploration. Virtual reality (VR) technology and 3D modeling technology, as the mainstream and cutting-edge interactive technology of "Internet celebrities" in today's museums, have been cleverly and flexibly integrated in the exhibitions of "King of Yue Gou Jian Sword" and "Zeng Hou Yi Chime Bell". Through the VR device, the audience can observe the specific details of King Yue's Gujian sword from a close, multi-angle and all-round perspective, and even have a deeper understanding of its casting process and the historical background behind it. With the help of 3D modeling technology, Zeng Houyi Chime bells will appear smartly in the VR glasses of the public, from which you can feel the charm and colorful ancient music culture. At the same time, the Zeng Houyi Chime Hall is also equipped with an

analog chime electronic display screen, equipped with virtual chime models and electronic piano models, with the help of digital audio synthesis technology and touch interaction technology, visitors can touch the electronic piano keys on the screen, real-time listening to each chime bell performance, corresponding to each note of modern music theory. This allows visitors to perceive the timbre of each chime on the spot and even perform simple songs through the chime, greatly enhancing the audience's interest in and understanding of ancient music culture, and narrowing the distance between each audience and each cultural relic and the profound culture behind it.

Fig 2. 3D modeling printed out the tomb model of Zeng Hou Yi (Source: https://baike.so.com/gallery/ list? Ghid = first & pic_idx=4&eid=5573887&sid=5788302)

Another impressive piece of technology is that when displaying Zeng Houyi's tomb, Hubei Provincial Museum used digital modeling technology and 3D printing technology to scale down the structure of the tomb and the funerary objects in the tomb to build a very vivid three-dimensional tomb model. Through the small tomb model displayed in the venue, visitors can understand the structure and layout of Zeng Hou Yi's tomb, imagine the social life scene at that time and the application of social production and living materials in life, and further perceive Zeng Hou Yi's status as a noble and the ritual and music system in the social background at that time.

In terms of the application of artificial intelligence technology in digital exhibitions, Hubei Provincial Museum has also actively explored and made considerable achievements. For example, in the intelligent navigation system, people can use the GPS positioning service and AI technology in the mobile phone application to achieve indoor positioning and path planning. Through this service, visitors can quickly and easily find the cultural relics or exhibition halls they are interested in visiting and playing, which greatly improves their own visiting experience.

2) Vigorously promote regional culture, and technology enables cultural dissemination: Hubei Provincial Museum, as an important display platform and new cultural highland of Jingchu culture, undertakes the responsibility and mission of inheriting and carrying forward the local characteristic regional culture. It mainly through digital exhibition interactive narrative, with the help of modern technological means to expand the depth and breadth of its own regional cultural communication.

In the "Three Gorges Forever - Three Gorges Cultural Relics Protection and Utilization Digital Exhibition", the museum integrates geographic information system (GIS), virtual reality (VR), augmented reality (AR), interactive experience device and integrated projection technology to build an online virtual display platform and another offline pure digital exhibition hall. The main content of this exhibition covers the natural landscape and history and culture of the Three Gorges of the Yangtze River, with rich and unique content and interesting forms. Through the touch screen, motion sensing and other fresh interactive experience devices, visitors can independently choose the tour path and content focus and deeply understand and learn the rich connotation and long history of the Three Gorges culture. This highly interactive and immersive design significantly improves the audience's participation and sense of experience, and at the same time effectively expands the overall scope of cultural communication on a macro level, enabling visitors to better understand and appreciate regional culture, and then disseminate regional culture together.

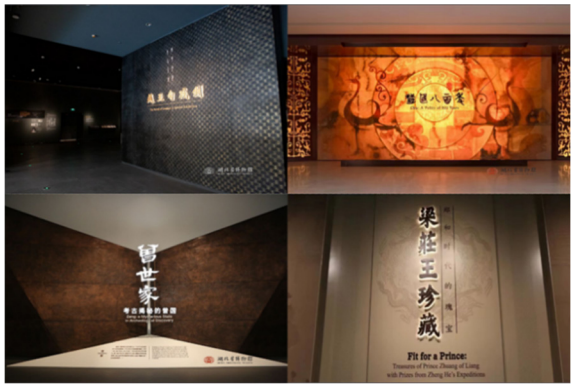

Fig 3. Multi-exhibition hall multi-linear narrative features exhibition hall distribution (Source: Hubei Provincial Museum)

In the experience of modern museum visitors, foreign museums pay more attention to the visitors' own play experience, while domestic museums pay more attention to the culture-oriented exhibition form. Hubei Provincial Museum also pays attention to this point, which uses multi-linear narrative structure and interactive experience devices to achieve a tacit balance between the exhibition and the human and cultural relics themselves. Through the unization of several different exhibition halls, such as "Chu 800th Century Exhibition Hall", "Zeng Family Exhibition Hall" and "Zeng Hou Yi Exhibition Hall", the multi-linear exhibition halls with historical narratives are scattered throughout the museum, and interactive devices are combined to explain historical information of cultural relics and related ancient culture and modern scientific knowledge principles, effectively enhancing the freedom and richness of visitors. This is an important step for famous domestic museums to learn from the construction of western excellent museums. According to their own interests, the audience can independently choose the order of the exhibition hall and the content of the exhibition and carry out a spontaneous and diversified in-depth exploration of the historical background and cultural connotation of the cultural relics. This kind of design thinking gives the audience greater autonomy and convenience to explore and understand the culture and greatly enriches the content and form of cultural communication. Especially for the diversified and rich Jingchu culture, the different preferences of different audiences can be more satisfied under this design link, so that

the audience can deeply feel the unique charm of Jingchu culture in the interactive experience.

3) Reconstruct tourist visiting mode to create embodied experience

The application of digital exhibition interactive narrative has made a qualitative leap in the visiting experience of visitors to Hubei Provincial Museum and also reconstructed the relatively traditional and outdated visiting mode. This enables the museum to win the unanimous recognition of visitors and also brings more practical experience to the operation of the museum.

In addition to the cultural and creative shops and punch card points of today's net celebrities in the venues, relying on digital technology, the idea of intelligent printing cultural and creative souvenirs has gradually become a unique form of tourists' visiting mode. The set up automatic machine can use the text content or pattern desired by tourists, scan the exclusive QR code, and intelligent imprint on the museum souvenirs selected by them to get the tourists' exclusive favorite cultural and creative goods, greatly satisfying the visitors' emotional needs with typical famous cultural relics, as well as diverse needs for visiting experience.

A variety of interactive experience devices in the exhibition hall enhance the audience's sense of participation, and this interactive experience enriches the exhibition content. With "audience" as the main body, visitors are no longer limited to the traditional form of visit and can obtain a more diversified form of understanding and play experience for the cultural relics on display. In addition, the interactive installation will also involve some natural historical knowledge of popular science content, to add a stronger cultural knowledge to the visit process.

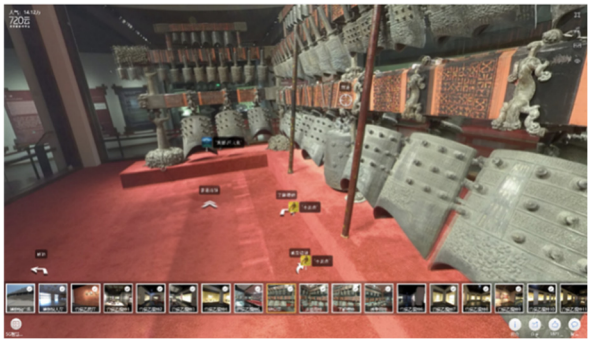

Fig 4. Each function is displayed in a digital guide of Hubei Provincial Museum

(Credit: Photo taken by the author)

As a hot topic in today's era, big data analysis technology is also playing an important role in museum operation, which profoundly changes the visitor's visit process and mode. It will provide personalized suggestions for visitors based on their interests, preferences and behavior patterns. Combining the intelligent navigation system developed by artificial intelligence (AI) technology with the GPS positioning system, visitors can obtain real-time navigation information and personalized recommendations through mobile apps or specific devices equipped at the scene. This personalized guidance mechanism can optimize the audience's visiting experience, make the exhibition content accurately meet the needs of different audiences, make the visiting service more thoughtful, the visiting experience freer and more convenient, compared with the traditional fixed single exhibition route, it brings the audience a more pleasant and relaxed visiting experience.

The museum also attaches great importance to the feedback of the audience, and the official will collect opinions from all parties through various channels such as online and offline and use big data analysis and intelligent AI to improve the exhibition layout and form in a timely manner. For example, with the help of feedback from visitors, the museum has optimized the interactive link of chime bells in the Zeng Houyi Chime Bells exhibition hall, and the authorities have added more historical background introduction and cultural knowledge explanation to enrich the user experience. This approach gives visitors a greater sense of participation in the museum's decision-making, is a unique part of its visit format, and benefits the long-term operation of the venue itself.

5. Conclusion and Prospect

This study has deeply explored the application of interactive narration in museum digital exhibitions under the background of digital transformation. Taking Hubei Museum as the main research object, a series of important findings have been obtained through various analyses and research methods. Digital exhibition interactive narrative, as a crucial direction in museum digital transformation, brings new opportunities and vitality to museum development. Through innovative interactive narrative design, the audience can be more deeply engaged in the exhibition, experiencing the historical and cultural charm behind the cultural relics, thus enhancing the museum's cultural communication power and social influence.

However, to achieve the sustainable development of interactive narration in digital exhibitions, museums need to continuously overcome challenges in technology, content, and meeting audience needs. They should continue to explore and innovate to provide visitors with more high - quality and rich digital exhibition experiences.

References

[1] Xu, L., & Zeng, L. (2016). Digital storytelling and interactive digital narrative. Publishing Science, 24(3), 96-101.

[2] Sun, W. (2020). Interactive Media Narrative. Wuhan: Wuhan University Press.

[3] Zhu, L. (2024). A study on the narrative modes of intangible cultural heritage exhibitions in museums based on bibliometrics (2013-2023). Chinese Folklore Network. Retrieved from https://www. chinafolklore. org/web/ index. php? NewsID=22333Jjjj.

[4] Zhang, H. (2023). Exploring the New Forms of Museums in the Digital Age: Ten Trends in Museum Digital Development. Retrieved from https://www. sohu.com/a/ 7398999052040939 072.

[5] Li, M. (2023). The Application of Modern Digital Display Technology in Museum Exhibition Design. Retrieved from https://www.cqvip.com/article/article.aspx?id=710974578.