The role of digital museums in the dissemination of historical dance traditions among young people

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ABSTRACT

The aim of this research is to examine various aspects of Chinese folk dances, their representation in digital museums, and their influence on shaping the perception of dance culture among young people aged 15–20 years. The research is conducted in several stages. The first stage involves identifying the specifics of Chinese folk dances that should be considered for reflection in digital museums. The second stage is based on studying the features of successful digital museums' functionality that could be utilised for the study and dissemination of folk dances among youth. The third stage of the research involves studying the elements of folk dance that should be separately represented in virtual scenarios. It was found that one of the most significant Chinese folk dances is the Yangge Dance. The Yangge Dance (扬歌舞) is performed by groups of people and is characterised by energetic movements that are associated with agricultural activities. The Dragon Dance (舞龙) and Court Dance (宫廷舞蹈) are associated with theatrical performances, facilitating the transmission of symbolic elements. The Gaguang Dance (嘎冈舞) and the Gochjo Dance (国剧舞) have lesser significance as they convey the peculiarities of individual ethnic groups. It was determined that the advantages of digital museums for the dissemination of folk dances include the ability to convey body movements, provide three-dimensional (3D) space, engage in interactive dances and utilise video analytics. It was established that digital museums should ensure accuracy in preserving costumes, movements, musical accompaniment, historical chronology and colour characteristics, thus preserving the uniqueness of historical aspects for the promotion of dance culture. The practical significance of this study lies in the potential for preserving folk dance culture through an orientation towards the capabilities of digital museums and the identification of specific elements of folk dances through concrete examples.

Keywords

Dragon Dance, historical chronology, interactive technologies, museum space, video analytics, Yangge Dance

Introduction

In Chinese culture, where the past tightly intertwines with the present (Driver 2011), the preservation and transmission of traditions play a key role in maintaining national identity (Fan et al. 2020). In recent decades, with the advancement of technologies, digital museums have become an integral part of this process, offering new avenues for accessing rich cultural heritage (Kamariotou et al. 2021; Luther et al. 2023). A digital museum constitutes a virtual platform that provides access to museum collections and exhibitions via the internet (Lopes 2020; Marty 2008). It can be a part of a physical museum or an independent entity. The digital museum comprises a set of digital objects, ranging from digitised physical artifacts to newly created media with immersion and interaction capabilities (Doukianou et al. 2020). Particularly concerning Chinese dance traditions, digital museums serve as indispensable tools facilitating the dissemination and assimilation of the rich heritage of centuries-old history (Liu and Lan 2021; Wu et al. 2022).

Chinese folk dances differ from European dances, which are typically characterised by linear movements (Shan Chou and Singh 2022). Chinese dances often include movements

that follow a spiral or circular pattern (Shan Chou and Singh 2022). The most ancient dances were performed as a form of worship to various gods and were associated with superstitions related to successful hunting, rain and other aspects of life (Mullis 2017). Dances that were formed during the Zhou Dynasty (12th–3rd century BCE) were used for ceremonial purposes and have been preserved to the present day, such as the Long Sleeve Dance (长袖舞) (Wilcox 2016). During the Han Dynasty (3rd century BCE – 3rd century CE), there was an emergence of dances from various ethnic minorities residing in China, which contributed to the development of new historical aspects of dance culture (Ying and Chiat 2016). The Tang Dynasty (7th–10th century) witnessed the greatest flourishing of dance culture. The renowned dance academy Pear Garden – an ancient theatrical society specialising in opera, pantomime and other forms of dramaturgy – emerged during this period. Within the scope of its productions, participants of Pear Garden choreographed over 60 diverse dances (Ying and Chiat 2016).

Popular dances are characterised by specific patterns that contribute to creating a comprehensive impression of life, traditions, movements, plasticity and musical accompaniment (Miao 2022). When considering the historical aspects of dance development, the Tang Dynasty marks the final stage of dance as an independent art form, as subsequent stages witnessed the integration of dance with dramatic arts (Chiu et al. 2023).

Youth (individuals ranging in age from adolescence to early adulthood) play a significant role in the preservation and promotion of cultural heritage, including traditional dances. Their involvement and interest in this domain can contribute to the preservation and transmission of dance traditions to future generations. In the modern world, where youth spend increasingly more time online and are fascinated by technology, the interactive capabilities of digital museums offer a unique opportunity for the dissemination of dance culture (Srinivasan et al. 2009; Torres 2023). However, it is worth noting that digital museums can also be beneficial for elderly practitioners and audiences, providing them with access to extensive collections and educational materials (Grácio 2020). Visualising museum spaces facilitates the accurate representation of musical collections and showcases the specifics not only of costumes and ornaments but also of movements, which play a crucial role in dances (Giannini and Bowen 2023).

Thus, folk dance constitutes an integral part of China's cultural heritage, spanning several millennia. Digital museums provide a unique opportunity for disseminating historical dance traditions among the youth. They afford access to extensive collections, educational materials and interactive resources, which can engage young people in the study and comprehension of Chinese folk dance (Torres 2023). The research aims to examine various aspects of Chinese folk dances, their representation in digital museums, and their influence on shaping the perception of dance culture among the youth.

Literature review

Transmission of dance cultural heritage

The Guangdong Experimental Program is organised by a group of cultural researchers and choreographers from Guangdong Province in China, with its centre in the major city of Guangzhou. It encompasses both local and international dance specialists and has been operational for the past several years, continuing to evolve to this day. The objective of the Guangdong Experimental Program is to explore the characteristics of American and Chinese dance, as well as their fusion. The project aims to convey various cultural values through dance and to study the specifics of classical dance considering both American and Chinese traditions. The program includes a series of master classes, seminars, lectures, research projects and creative performances. It is facilitated through intensive training, exchange of experiences and knowledge among participants, as well as the creation and demonstration of collaborative choreographic works.

The accuracy of conveying dance movements depends on the study of the culture of each country, which contributes to the reflection of national traditions (Miao 2022). Chinese dances play a significant role in the artistic expression of national identity and cultural values (Fan et al. 2020). They are diverse in style and form, reflecting a myriad of regional and ethnic traditions, and incorporate elements of music, theatre and folk customs (Wilcox 2018). Often performed in various contexts such as festivals, celebrations, theatrical performances and ceremonies, they serve as an important means of transmitting and preserving China's cultural heritage (Wilcox 2020). Furthermore, Chinese dances continue to evolve and adapt to contemporary trends and technologies, maintaining their importance and relevance in modern society (Miao 2022).

The use of modern technologies (Weibo, WeChat) enables the popularisation of Chinese dance, considering the possibility of transmitting traditional movements or introducing new artistic forms. Moreover, modern technologies can facilitate the promotion of ethnic minority dances, which enriches national art. Development of dance movements can be achieved through computer technologies that facilitate the reflection of automatic movements of folk dance. During the preparation of a dance, it is essential to study the specifics of the music and to establish mechanisms for synchronising it with dance movements. Automatic generation of folk dances enables the precise transmission of folk movements, allowing for the conveyance of specific rhythms (Cai et al. 2023). Folk dance should be founded on the provision of dance-aesthetic knowledge, which is constructed upon an interdisciplinary model. The aesthetic of movements manifests in the artistic perception of dance. The performance of dance should not merely involve the mechanical reproduction of movements but rather serve as an expression of profound emotions, ideas and contexts (Cai et al. 2023). In the context of artistic value, dance should be an art form that touches spectators, inspires them and elicits an emotional response (Fan et al. 2020). Furthermore, dance should also serve as a means of education and enlightenment (Zhao 2023). It can convey historical or cultural narratives, represent various dance styles or traditions, and explore themes and ideas through movement and music (Zhao 2023). Through observing and analysing dance performances, spectators can acquire new knowledge, understanding and inspiration. Therefore, ensuring unique artistic and educational value ensures that dance becomes not only an art form but also a means of education and cultural enrichment. Traditional dances are based on an understanding of national culture (Zhao 2023). The advancement of information technologies enables the comprehensive study of dance in conjunction with music and artistic expression. Artistic skills during the dance can be cultivated using the Broyden–Fletcher–Goldfarb–Shanno digital system (BFGS). BFGS is an optimisation method employed for locating the local minimum (or maximum) of a function (Lai et al. 2021). In the context of digitising traditional dances, the BFGS system can be considered for adjusting the parameters of animation or modelling dance movements to accurately reflect the desired style or traditional choreographic elements (Li and Ismail 2022). With the aid of this digital system, the transmission of ethnic movements that harmonise predominantly with the chosen musical composition can be facilitated (Li and Ismail 2022).

The aesthetics of dance movements are linked to the possibility of combining different dance styles in music. The dance must convey the artistry of performance and uphold strict musical forms that contribute to the dynamism of execution. Chinese dances transmit distinct symbolic features connected to the performance of various rituals (Wilcox 2018). Red Women's Detachment is a Chinese dance that reflects ideological content, showcasing the specificity of martial arts and elements of folk dances. Additionally, this dance incorporates traditions from the Beijing Opera, captivating the audience's attention.

The role of digital museums in disseminating dance heritage

Digital museums contribute to the transmission of intercultural aspects of dance, ensuring the accuracy of their interpretation (Gibbs 2017). A digital museum serves as a unique educational space, combining the possibilities of various disciplines (such as culture, informatics, history, philosophy, etc.) to convey the uniqueness of museum exhibits (Zhao et al. 2023). Interactive technologies facilitate the transmission of additional elements that contribute to enriching the informational space (Eardley et al. 2016; Hou et al. 2022). Virtual museums have contributed to art appreciation during the COVID-19 pandemic (Meng et al. 2023). The presence of digital museums has attracted 1.5 times more visitors than traditional museums (Munday et al. 2023). This approach enables interaction with museum visitors, identification of their preferences and a focus on studying specific museum exhibits.

Expanding the understanding of dance culture through digital museums can be achieved through the visualisation of museum collections, fast access to museum collections, the creation of various exhibition formats and the use of virtual reality technologies (e.g. using special beacons, and magnifiers for studying historical exhibits) (Skublewska-Paszkowska et al. 2022; Taurino 2023). Additionally, the establishment of digital museums contributes to attracting a larger number of visitors, fostering cultural education (Gran et al. 2019). Digital museums create new opportunities for storing and transmitting culturally oriented museum exhibits, thereby facilitating the realisation of various social projects (Ikeda et al. 2022). New technologies not only facilitate the understanding and study of historical aspects but also focus on visitor participation (Yang 2014).

The conducted literature review identified that the examination of traditional dances is predominantly associated with the study of their aesthetic component and allows for the possibility of preserving the aesthetics of movements, which can be disseminated through various festivals. Research gaps exist in regards to investigating the role of digital museums in the dissemination of Chinese dance traditions.

The research objectives were as follows:

- 'To examine the specific characteristics of various types of Chinese folk dances, considering their potential in digital museums.
- 'To identify the advantages of the functionality offered by digital museums in engaging visitors and shaping their perception of folk dance among the younger generation.
- 'To explore the elements of dance culture that should be taken into account in digital museums to ensure a holistic understanding.

Methodology

Sample

The study involved 248 participants aged 15–20 years who attended specialised dance sections or received professional dance education at higher educational institutions. The selection of respondents was limited by age and field of activity, allowing for an exploration of the specific aspects of dance history perception and retention among the younger generation. The study involved 124 male participants and 124 female participants, who were selected from various regions of China. Initially, it was planned to include respondents aged 40–50 years in the study; however, different approaches are required when conducting research involving different age groups. As the participants in the study possessed knowledge about the specifics and variations of folk dances, there was no need for additional lectures on their study. To conduct the research, contracts were signed directly with the respondents or their parents (for under-age participants) to ensure their voluntary participation in the study.

Ethical considerations during the research were addressed through an examination of the guidelines provided by Israel and Hay (2006). Adhering to ethical norms ensured the accuracy and integrity of the research process while safeguarding the rights and obligations of the participants.

Research design

The first stage of the research involved determining the specific characteristics of Chinese folk dances that should be considered for representation in digital museums. The selection of dances for investigation was based on their significance and popularity in China and beyond. Initially, approximately 80 dances were chosen for the study, allowing for an exploration of the specificities of their performance and dance movements. Among the selected dances were the Yangge Dance (扬歌舞), Gagaun Dance (嘎冈舞), Dragon Dance (舞龙), Gochjo Dance (国剧舞), and Court Dance (宫廷舞蹈). An analysis of these various forms of Chinese folk dances was conducted, examining their distinctive features and identifying those most significant for representing the history of Chinese dance. The Likert scale was employed to gather information from respondents regarding the different types of folk dances and their importance for preserving cultural heritage. Respondents were asked to assign scores ranging from 1 to 5 to each dance form, allowing for the determination of their significance based on their significance in preserving cultural heritage.

The second stage of the research was based on studying the features of the functionality of digital museums that can be used for the study and dissemination of folk dances among young people. Determining the advantages of digital museums involved comparing the capabilities of traditional museums and digital museums with regard to the specificities of dance culture. The identified advantages allowed for the determination of which elements of the functionality, as perceived by the respondents, contribute to the interest of young people in visiting digital museums and studying folk dance culture.

Furthermore, during the second stage of the research, recommendations were developed for creating a virtual digital museum. For this purpose, an analysis of various digital museums (such as the Cooper Hewitt Smithsonian Design Museum, Brooklyn Museum, Cleveland Museum of Art, American Museum of Natural History, National Museum of Australia, etc.) was conducted to study their specific features and assess the level of visitor interest in visiting these museums. Examination of these museums, among others, yielded valuable lessons and best practices in the realm of creating virtual digital museums.

For example, successful digital museums often offer interactive elements that enable visitors to engage with museum exhibits and content: virtual tours, multimedia presentations, gamification elements, virtual assistants, and more. Second, the creation of virtual simulations and models, as well as the implementation of augmented reality for viewing additional information about exhibits, can significantly enrich visitors' experiences by allowing them to interact with exhibits in a new dimension. Third, the utilisation of diverse multimedia resources (videos, audio, virtual walkthroughs, interactive maps) helps to enrich the content and make museum visits more engaging and informative.

To develop the recommendations, an analysis of existing interactive technologies that could be used in the development of digital museums was also conducted. Approximately 200 modern programs and platforms were selected for analysis (A-Frame, Google Arts & Culture, The Google Expeditions platform, Unity, SketchUp, Unreal Engine, etc.), where their advantages and disadvantages were identified. This facilitated the selection of The Pen technology, used in the Cooper Hewitt Smithsonian Design Museum, which enables 3D visualisation. Visitors are provided with a special device called 'The Pen', which resembles a pen or stylus. Throughout various sections of the museum, touchpoints are installed, which recognise the device when it is nearby. Visitors can touch the device at these touchpoints to obtain additional information about the corresponding exhibit. Visitors can scan exhibits of interest using the device, and then receive virtual 3D models of these objects on their devices or special displays within the museum.

The VRTech application allows for the simulation of folk dance movements using virtual reality technologies (Wang and Tseng 2023). Through the VRTech app, users can immerse themselves in a simulated environment where they can observe, study and even practise dance movements in a virtual space. Google Expeditions is an educational platform by Google that enables teachers and students to explore virtual worlds and places using virtual and augmented reality. The platform allows for the creation of interactive tours and educational materials. The Google Expeditions platform was chosen for its user-friendly nature, providing access to the museum from various operating systems. Additionally, among the supplementary interactive technologies, options such as Make a Face (generating a virtual face in virtual space), Journeys of Invention (information regarding various inventions, their creators and historical contexts) and Artec Eva (a 3D scanner for generating high-quality 3D models of objects and surfaces) were proposed, as they were found to be more suitable for implementation in digital museums based on the conducted analysis.

The third stage of the research involved the study of elements of folk dance that should be represented separately in digital museums. To achieve this, an additional analysis was conducted, focusing on the specific characteristics of over 50 more folk dances, similar to the first stage of the research. By employing a comparative method, it was determined that the history of dance could be conveyed through costumes, specific movements, musical accompaniment, historical chronology and colour features. To determine dance elements that can be most accurately reproduced or conveyed in digital museums, a conformity index has been developed. This index, created based on a specific formula, allows for the assessment of how effectively and accurately dance elements can be reproduced in a digital environment.

The comparison of the obtained calculations, similar to the first two stages of the research, was performed using the correlation coefficient (1).

Statistical processing

The validation of the calculations also requires additional confirmation, which was achieved by employing statistical confirmation formulas. The results were obtained using the correlation coefficient (Carvalho and Matos 2018):

$$k_s = \frac{\sum_{i=1}^{n}(p_i - p_{cp})^{1/2}}{n-1}, \quad (1)$$

where:
n *is the number of parameters being compared,*
p_i *represents the relative calculated value of the investigated parameter,*
p_{cp} *is the arithmetic mean value among the investigated parameters.*

Interpretation of the correlation coefficient is as follows:

- 0 – 0.3: very weak correlation between the parameters. This implies that there is almost no linear relationship

between the variables, or it is very weak. Changes in one variable are scarcely associated with changes in another variable.

- 0.3 – 0.5: weak correlation between the parameters,
- 0.5 – 0.7: moderate correlation between the parameters,
- 0.7 – 0.9: high correlation between the parameters,
- 0.9 – 1: very high correlation between the parameters.

This indicates a very strong linear relationship between the variables. Changes in one variable are practically always accompanied by changes in another variable in the same direction.

To gather data from the respondents (the respondents evaluated the significance of the selected advantage), a Likert scale was also used, enabling the calculation of the conformity index:

$$k_i = \frac{\sum_{i=1}^{n} B_j + p}{0{,}5 * g(g-1)}, \quad (2)$$

where:
B_j *represents the assessment of the accuracy of conveying aspects of dance movements through the selected technology in a digital museum,*
p *denotes the obtained results from the respondents regarding the significance of the chosen advantage, and*
g *stands for the number of selected advantages for the study.*

The statistical processing of numerical data was carried out using Microsoft Excel software, which does not require additional expertise in learning its approaches. The implementation of the Microsoft Excel program ensured the accuracy and correctness of the presented calculations.

Results

Chinese folk dances are characterised by their diversity, which allows for the portrayal of unique historical events, regional specificities and the distinctive dance movements of ethnic minorities. This study has explored the distinctive features of traditional Chinese dances that need to be taken into account when representing them in digital museums. The dances that primarily reflect historical events were identified by the respondents (Figure 1).

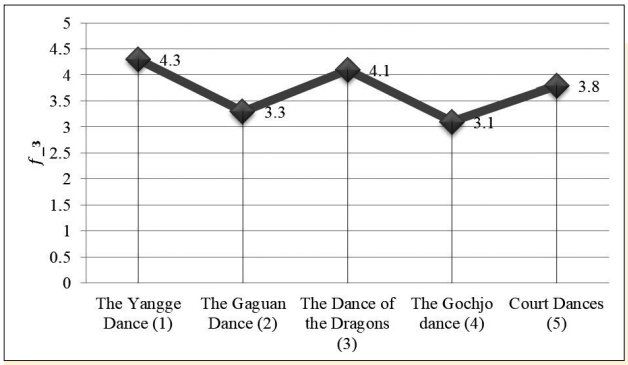

Figure 1
The analysis of Chinese folk dances that primarily contribute to the reflection of national traditions
: (1) – (2): 0.22; (1) – (3): 0.83; (1) – (4): 0.24; (1) – (5): 0.51; (2) – (3): 0.24; (2) – (4): 0.93; (2) – (5): 0.78; (3) – (4): 0.28; (3) – (5): 0.53; (4) – (5): 0.59

The Yangge Dance (4.3) has an ancient history in China and is characterised by a high level of mastery of dance movements. This folk dance ('Yangge translates to 'rice seedling song') is distinguished by its remarkable stability, elements of humour, and powerful movements that facilitate the transmission of the aesthetics of folk culture. The dance is characterised by a clear rhythm, which creates a joyful atmosphere that can be enhanced through the accompaniment of drums. During the dance, the shoulders play a central role in the rotation, while emotions and feelings are expressed through the use of colourful scarves. In the 1980s, the Yangge Dance gained popularity worldwide, contributing to its influence on the development of other forms of Chinese dance. The Dragon Dance (4.1) ranks second in importance among Chinese folk dances due to its intricate execution, which limits the incorporation of its movements into other dances. The dance of the dragon also holds symbolic significance, as it was historically performed to summon rain. Most commonly performed during the Chinese New Year, the dance of the dragon embodies the strength of the Chinese people. Approximately 50 individuals can participate in the dance, demonstrating synchronised movements. The execution of the dance involves the depiction of the dragon's body using special poles, enabling the performance of complex undulating movements. The performance of the Dragon Dance is also associated with the myths and legends associated with dragons as powerful and auspicious beings.

The Court Dance of Prince Qin's cavalry (3.8) is historically significant as it glorified the might of the imperial army. However, the dance is no longer performed, which has impacted its value to the national culture. The Court

Dance, which involved a large number of participants, resembled a theatrical production. The Gaguan Dance (3.3) is less important in shaping the national culture as it reflects the characteristics of a specific province, Yunnan. The dance is characterised by elegance, beauty and subtle movements. It involves conveying delicate movements that carry various symbolic meanings. Symbolic significance is also attributed to the 'three turns', which are formed through the bending of all joints in the body and arms, enhancing the gracefulness of the movements. Meanwhile, the strikes in the dance are characterised by swiftness, and the primary movement involves the trembling of the body from top to bottom during flexions. The Gochjo Dance (3.1) also reflects the regional folk traditions of the Tibetans, one of the largest ethnic groups in China. The dance is based on the imitation of animal behaviour, which adds vibrancy to the dance interpretation. In rural areas, the dance is performed rapidly, with the tempo changing several times. The dance incorporates movements that form two semicircles, generating undulating motions. To enhance vibrancy, the dance concludes with highly rapid movements. In southern regions, the dance is performed with greater vigour, and the jumps are characterised by naturalness, reflecting the local colour.

The study of the characteristics of traditional Chinese dances has allowed for their most distinctive aspects to be identified for consideration. As the second stage of the research, it was planned to determine the significance (functionality) of digital museums in conveying historical events. Additionally, it aimed to identify the variety of advantages that predominantly contribute to respondents' interest in visiting digital museums to explore the historical specifics of folk culture (Figure 2).

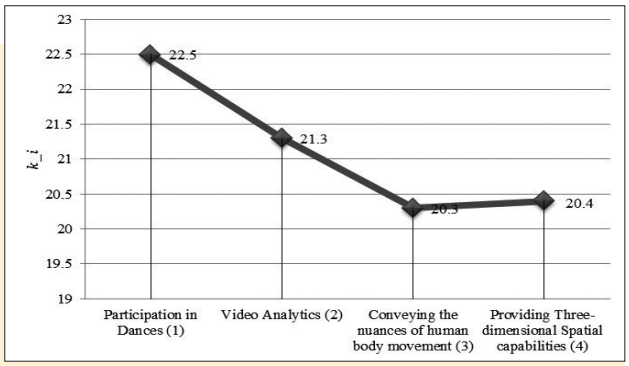

Figure 2
The advantages of the functionality of digital museums that contribute to the study of traditional folk dances
: (1) – (2): 0.71; (1) – (3): 0.65; (1) – (4): 0.67; (2) – (3): 0.73; (2) – (4): 0.64; (3) – (4): 0.92

Participation in dances (22.5, Figure 2) fosters a greater interest among visitors through interactive engagement, enabling the replication of traditional dance movements and enhancing the appeal of the museum experience. This facilitates a reevaluation of the dance itself and contributes to a more enriched perception. Engaging in museum events enables the exploration of historical aspects of the dance. Additionally, this approach may involve the execution of specific movements as part of small quests, aiding in the unravelling of particular concepts. Video analytics (21.3, Figure 2) holds significant importance in digital museums as it allows for assessment of viewers' reactions to exhibits that resonate with them the most. It also assists in identifying which elements within the digital museum (such as text, videos, individual artifacts, etc.) capture visitors' attention to a greater extent. Video analytics facilitates the adjustment of information delivery and exhibit placement, thus influencing the attraction of a larger number of visitors.

Providing 3D spatial capabilities (20.4, Figure 2) facilitates a detailed perception of dance movements, taking into account the aesthetics of historical dance and conveying its inherent emotional depth. The 3D elements enable immersion in a sonic reality, influencing the transmission of specific characteristics from distinct historical epochs and facilitating the communication of a comprehensive worldview. Volumetric holograms allow for a higher level of precision in representing dance. Conveying the nuances of human body movement (20.3, Figure 2) during the dance is not feasible in traditional museums. The transmission of nuances in human movement during dance poses a complex challenge, particularly in traditional museums where access to live performances may be limited. Digital museums offer unique opportunities to convey these nuances in human movement during dance through interactive capabilities (such as specialised interfaces, motion sensors or virtual reality), playback technologies, scaling and multidimensional representation. Interactive technologies enable the transmission of dance movements in a digital format, fostering visitors' immersion in the dance actions. This approach facilitates the communication of the complexities of dance, encompassing historical stylistic elements that extend beyond movements and encompass aspects such as costumes, musical accompaniment and various other components. Such an approach in museums allows for the visual representation of the beauty of dance movements, enabling visitors to immerse themselves

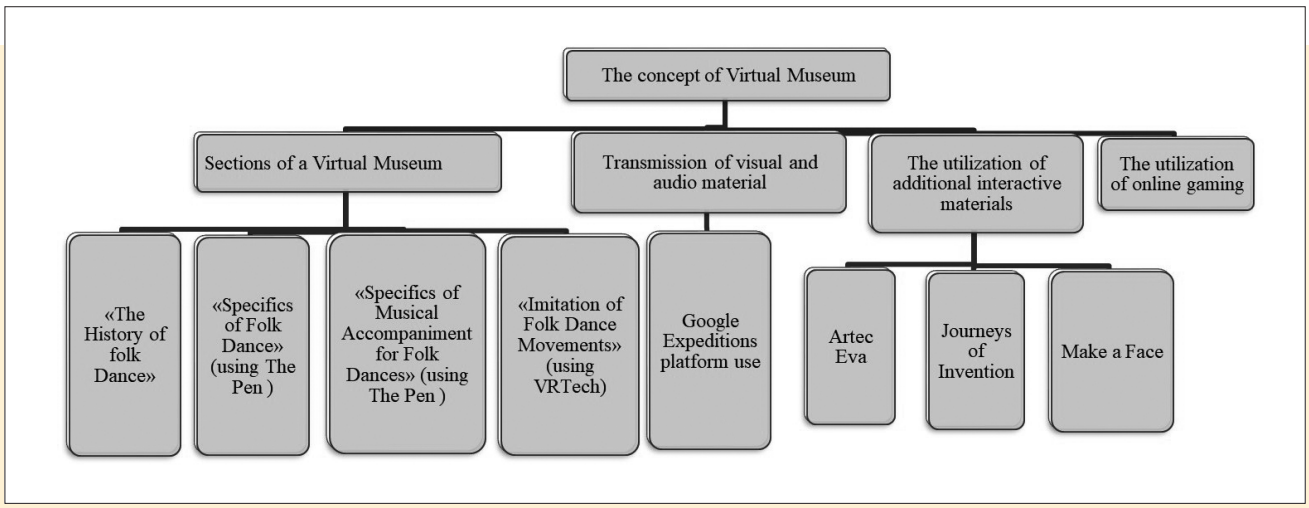

Figure 3
Concept of a virtual museum
Source: Author's work.

in the historical culture while considering the artistic nature of folk dance and its expressive aspects. Interactive technologies facilitate the transmission of harmonious movements, body articulation, rhythm and the necessary dynamics.

The implemented components of the digital museum, which contribute to engaging the younger generation in the study of folk dances, have facilitated the development of recommendations for shaping the concept of a virtual museum (Figure 3).

Based on the obtained results and experience of successful digital museum operations, recommendations have been proposed. To motivate the younger generation to explore folk dances, it is advisable to provide relevant virtual sections (Figure 4). A section on 'The History of Folk Dance' would include a description of the dance's formation specifics alongside virtual icons. Clicking on these icons will take the visitor to depictions of the atmosphere of a particular era in dance creation and to a showcase of elements of ancient choreography. Information accessed by means of the virtual icons should be presented through photographs, videos and illustrations of historical documents to facilitate immersion in the historical epoch.

Figure 4
Home page of the Digital Museum of Chinese Folk Dance website
Source: Author's work.

Additionally, the virtual museum website should include a section titled 'Specifics of Folk Dance', which will display various dances in video format and through graphic images. The integration of The Pen technology on digital devices enables the provision of 3D visualisations of folk dances.

The section entitled 'Specifics of Musical Accompaniment for Folk Dances' can be presented in a format that combines individual dances (with brief descriptions of their specifics) and their accompanying music. The 3D visualisation facilitated by The Pen technology allows for the unique characteristics of each dance to be conveyed. This section should also feature the musical instruments accompanying the dances, along with descriptions and the capability to explore their diversity by clicking on corresponding virtual icons.

Ensuring the presence of a section titled 'Imitation of Folk Dance Movements' enables visitor engagement within the virtual museum through a 3D virtual space (Figure 5).

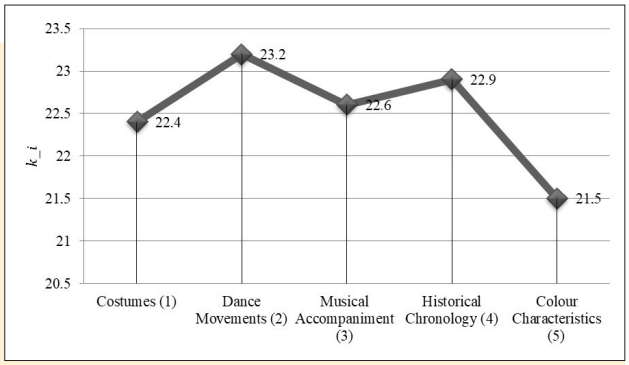

Figure 5
Elements of folk dances to be considered for studying historical characteristics through digital museums
: (1) – (2): 0.67; (1) – (3): 0.93; (1) – (4): 0.92; (1) – (5): 0.62; (2) – (3): 0.62; (2) – (4): 0.88; (2) – (5): 0.7; (3) – (4): 0.97; (3) – (5): 0.64; (4) – (5): 0.61

This section allows visitors to replicate movements of folk dances within the virtual digital museum. The VRTech application can be employed to ensure the accuracy of the replicated movements.

To ensure the precision of transmitting visual and video content, it is recommended to employ the Google Expeditions platform, which effectively reduces distortions in both sound and video. To utilise the platform, devices supporting virtual or augmented reality, the installed Google Expeditions application and a stable internet connection via wi-fi are required. The teacher should possess a mobile device to manage the expedition, while students should have devices compatible with the platform for virtual or augmented viewing. This facilitates a high-quality visual perception of the materials. Furthermore, the platform enables a more dynamic approach to virtual exhibits, fostering the use of diverse virtual technologies.

To foster the involvement of the younger generation in understanding the intricacies of Chinese folk dances, it is advised to incorporate supplementary interactive elements. For instance, the implementation of the Make a Face program allows users to find facial expressions resembling those found in fragments of folk dances, enabling visitors to match their facial expressions. The interactive program Journeys of Invention offers a virtual museum tour with various prompts. The utilisation of the Artec Eva scanner enables additional 3D visualisation during museum visits.

Incorporating online gaming features is crucial, allowing visitors to progress to the next level in each section of the virtual museum by answering questions or replicating specific dance movements. This fosters the engagement of the younger generation in the realm of traditional dances, and upon accumulating a certain number of points, they can win a book detailing the history of Chinese folk dances.

In Chinese folk dance, the presence of diverse elements is characteristic, encompassing not only movements but also musical accompaniment, costumes and additional props. The identification of elements to be considered in museum exhibitions was examined in the third stage of the research (Figure 5).

In digital museums, it is important to adhere to historical chronology (22.9, Figure 5) to convey the changes that occurred in folk dances during specific periods. The historical chronology should reflect alterations in movements, the number of participants in the dances, and changes in costumes or traditional musical instruments used for accompaniment. It should also facilitate the transmission of the form and content of the dances, including the necessary rhythm, to preserve the uniqueness and beauty of folk dances. This contributes to the reflection of the depth of national culture and takes into account the utilisation of various national styles aimed at preserving distinct regional and ethnic characteristics. For example, in the Dragon Dance, which originated approximately 2000 years ago, it is important to convey the specific changes in the dance, as it has become more vibrant over time, with more precise movements (Figure 6).

Figure 6
Elements of the Dragon Dance
Source: Depositphotos (2023)

The musical accompaniment (22.6, Figure 5) also plays a crucial role in conveying the specificity of folk dance, reflecting the historical events of visual arts. Modern technologies facilitate immersion in the musical space that characterises the specifics of individual dances. Music contributes to greater visitor engagement with the exhibition possibilities. The musical accompaniment of dances exhibits diverse dynamics and aesthetics. In digital museums, the capabilities of conveying the sound of unique musical instruments should also be taken into account. This process influences the technical immersion in historical events. When presenting the Court Dance in digital museums, it is important to convey the unique characteristics of melodies that have significant importance. The Court Dance depicts the music of ethnic groups, creating vivid and colourful performances.

In digital museums, it is important to ensure the uniqueness of dance movements (23.2, Figure 5), as each dance has its distinct characteristics. These movements can be conveyed through holograms and other elements of 3D space. There are some nuances to consider. The museum must provide necessary training and support to visitors for the proper use of devices and interaction with holograms. The museum should be equipped with specialised holographic projection systems for creating holograms, and possess appropriate software and network infrastructure for hologram creation and management. Visitors should use viewing devices such as virtual reality glasses or mobile devices with augmented reality support and may need to install specialised applications to interact with holograms on their smartphones. The movements play a significant role in conveying various moods and energies and can be associated with symbolic and ritualistic aspects. Such an approach facilitates the study of history in an interactive format. For example, a folk dance with fans is characterised by gentle, delicate and graceful movements, representing feminine beauty and elegance.

The colour characteristics (21.5, Figure 5) contribute to the conveyance of vibrancy and national aesthetics in dance performances. These colour features are manifested in attire and makeup, enhancing the overall dance portrayal. For instance, in the Miao Dance (Figure 7), silver shades are utilised to signify prosperity and abundance. In fan dances, multicoloured silk scarves are employed, in combination with lanterns and fans, to enhance the transmission of elegant movements.

Figure 7
Girls with traditional silver ornaments dancing the Miao Dance
Source: Museum of Ethnic Cultures, Minzu University of China

The Lion Dance uses colour features to convey symbolic meanings. The Northern Lion incorporates a combination of red, orange and yellow hues (Figure 8). These warm and vibrant colours express the lion's majestic nature and liveliness. For instance, red may symbolise power and energy, while orange and yellow symbolise strength and joy. The Southern Lion symbolises the role of protectors against evil spirits. The colours used in the dance may be more subdued to reflect the protective and balanced nature of this lion. For example, darker shades of blue or green are associated with wisdom and tranquillity. Contrasting colour depictions in the Lion Dance helps to accentuate the differences in the character, role and symbolic significance of each lion, rendering this dance more expressive and emotionally rich.

Figure 8
Costume variations from the Chinese Lion Dance
Source: Freepik (2023)

Costumes (22.4, Figure 5) in folk dances should receive special attention as they aim to facilitate the transmission of unique historical aspects. Costumes convey the artistic aspects of historical events and encompass clothing, footwear, accessories and distinctive makeup, allowing for the creation of a complete stage persona. Interactive technologies should be utilised in museums to effectively convey the texture, shape and colour of the costumes, ensuring an immersive experience for visitors. Dance costumes reflect the beauty and historical uniqueness of decorative arts. Costumes in dances with long sleeves were crafted from silk, symbolising moral conduct. The extended sleeves additionally serve the purpose of executing elegant and captivating movements that surpass the possibilities of conventional gestures.

Discussion

The influence of other cultures on China's dance culture contributes to serious issues resulting from the lack of preservation of national identity. Exploring the specificity of dance culture can be achieved through specialised lectures at universities, promoting the national spirit and cultural self-confidence (Tan 2021). Popularising dance culture can be accomplished through the preservation of cultural heritage. The utilisation of artificial intelligence elements and computer image recognition can aid in preserving national heritage by creating efficient systems for archiving, analysing and digitising cultural heritage. This approach enables the transmission of material and non-material resources, automating dance and identifying gestures and dance forms, thereby preserving cultural heritage (Reshma et al. 2023). The preservation of cultural heritage in digital museums is achieved through the digitisation of museum artifacts and their visualisation using 2D and 3D graphics. The use of re-enactment elements allows for the active interpretation of intangible cultural values, fostering the formation of transcultural memory (Meehan 2022). While our work did not examine the specifics of digitising museum artifacts, it is established that digital museums employ elements of video analytics, provide opportunities for 3D space, and enable participation in dances, contributing to the accuracy of conveying human body movements.

Modern museums are equipped with digital technologies, which influence the study of ethnic and cultural heritage. By incorporating additional festivals into museum exhibitions, it becomes possible to represent distinctive dance cultures and to use visualisation techniques to highlight their ethnic identity. A comprehensive understanding of dance intricacies can be attained through the study of theories related to national identity as well as the acquisition of practical skills (Sirica 2023). The transmission of dance culture through digital museums can be accomplished through the use of audiovisual techniques, which contribute to the formation of perceptions about dance specificities and foster a critical understanding of national culture. Visitor interaction with modern technologies for experiencing museum exhibits promotes emotional engagement, enhancing visitor involvement (Almoguera 2022).

While we did not specifically address audiovisual techniques in digital museums in our work, it has been established that to preserve the historical characteristics of Chinese folk dance during digital exhibitions, it is important to maintain the uniqueness of dance costumes and movements (Derry et al. 2022). Additionally, showcasing the specificity of musical accompaniment, historical chronology and colour features should be considered.

The exploration of the specificities of folk dances can be achieved through virtual reality technologies. Leveraging the capabilities of digital technologies enables their functionality as educational institutions. Digital installations facilitate enhanced interaction with specific environments, while digital museums contribute to the transmission of aesthetic atmospheres, influencing visitor engagement (Aristidou et al. 2021). Revitalising cultural heritage can be realised through a focus on harnessing the potential of digital museums and fostering the creation of installation art that effectively conveys the historical aspects, artistic essence and aesthetics of folk dances (Ergun and Aygenc 2018).

Digital capabilities contribute to the creation of virtual spaces that facilitate the exploration of the specificities of folk dances. The transformation of dance through digital technologies allows for artistic expression in education, thereby emphasising the importance of studying it. Furthermore, it helps to modernise the museum collections and enhances visitor engagement in their perception (Enhuber 2015). The significance of digital museums in preserving the historical aspects of dance culture has predominantly been examined from an artistic

perspective. In our study, we devote particular attention to the specifics of Chinese folk dances that should be portrayed during exhibitions in digital museums. It has been observed that several significant functions play a role in disseminating the historical aspects of dance among younger generations. These functions encompass video analytics, the representation of human body movements, the utilisation of 3D space and the opportunity for virtual participation in dances. Additionally, it is determined that to preserve a unique national identity, considerations should encompass not only dance movements but also other features such as costumes, music, colour characteristics and more.

To facilitate the popularisation of digital museums for the study of dance culture, the authors have developed a set of recommendations aimed at realising the aforementioned objectives. First and foremost, the establishment of a dedicated interactive map is essential for effectively showcasing the overall evolution of dance culture, as well as the distinct changes and progressions associated with each dance form throughout its extensive historical development. Furthermore, the integration of generative graphics systems should be pursued to enhance the visual representation of dance elements, resulting in a more vivid and immersive experience. In the context of digital museums, incorporating gamification elements proves to be an effective strategy, as it presents dance-related information in an interactive and engaging format. The incorporation of gamification elements into digital museums can be achieved through interactive games and tasks. This may include crosswords, quizzes, puzzles, or even virtual quests that encourage visitors to explore information about dances. Adding competitive elements, such as leaderboards or scoring systems, can incentivise visitors to participate in museum activities and compete with each other. This approach not only enhances comprehension but also fosters a sense of exploration, encouraging visitors to delve into the historical intricacies intertwined with the art form. Additionally, the use of robotics components can offer a unique opportunity to perceive and study dance movements using their emulation.

Research limitations

Following the completion of the study, certain limitations were identified by the authors. These limitations are associated with the lack of a detailed exploration of the specific capabilities of digital museums in conveying dance movements and musical accompaniment, which is intended to be addressed in future research. Despite these acknowledged limitations, the authors have examined the specifics of particular forms of folk dances and identified the most significant opportunities offered by digital museums for popularising folk dances among the younger generation.

Conclusions

Based on the findings of this study, it is evident that the preservation of national dance culture through digital museums necessitates careful consideration of the unique characteristics inherent in each dance form. Among the analysed dance varieties, it has been identified that each of these dances possesses its own history, style and symbolic significance, all of which play a crucial role in China's cultural heritage. For instance, the Yangge Dance is renowned for its vibrant and joyful atmosphere, cheerful melodies and festive costumes. It reflects the joy, community spirit and solidarity of the community, while also symbolising fertility and prosperity. The Dragon Dance is an integral part of Chinese cultural and religious tradition. The dragon symbolises strength, wisdom and luck in Chinese culture. The performance of this dance is accompanied by the sounds of drums, fireworks and a festive atmosphere. The Dragon Dance is often performed during the celebration of the Chinese New Year. The Court Dance is typically characterised by grace, elegance and a high level of performance technique. The Gaguang Dance, which originates from Yunnan Province, is distinguished by energetic movements, bright costumes and picturesque accessories that help to convey the performers' emotions and moods. The Gochjo Dance is a traditional element of Chinese opera. It combines elements of music, dance and drama and is often used to convey various plots and emotions.

It has been established that the promotion of folk dances through digital museums can manifest in various ways, depending on their functionalities. The conveyance of human body movements enables exploration of the precision and harmony of dance motions that have symbolic and historical significance. The provision of 3D space facilitates an immersive dance experience, including auditory realism. Active participation in dances engages the younger generation in re-enacting dance movements through interactive solutions. Video analytics allows for tracking of

the audience's response to the most captivating exhibits. The development of a unique concept and recommendations for shaping the virtual space of a digital museum aims to enhance the engagement of the younger generation in studying Chinese folk dances. To realise the virtual museum concept, technologies such as The Pen, VRTech, Google Expeditions, Make a Face, Journeys of Invention and Artec Eva were proposed to be utilised. It has been established that attention should be given to each element of dance to convey the historical atmosphere effectively. Emphasis should be placed on costumes, movements, musical accompaniment, historical chronology and colour features.

The practical significance of this study lies in exploring the possibilities of enhancing the transmission of folk dance characteristics through digital museums. Future research prospects may involve investigating the specific functionalities of digital museums in conveying the unique aspects of folk dances and musical performances.

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