

# Evaluating the management of ethnic minority heritage and the use of digital technologies for learning

Ethnic curation  
in the  
provincial  
museum

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## Abstract

**Purpose** – This article examines curatorial practices, both traditional and digital, in the Guizhou Provincial Museum's ethnic exhibition to assess their effectiveness in representing ethnic minority cultures, fostering learning and inspiring curiosity about ethnic textiles and costumes and associated cultures. It also explores audience expectations concerning digital technology use in future exhibitions.

**Design/methodology/approach** – A mixed-methods approach was employed, where visitor data were collected through questionnaires, together with interviews with expert, museum professionals and ethnic minority textile practitioners. Their expertise proved instrumental in shaping the design of the study and enhancing the overall visitor experience, and thus fostering a deeper appreciation and understanding of ethnic minority cultures.

**Findings** – Visitors were generally satisfied with the exhibition, valuing their educational experience on ethnic textiles and cultures. There is a notable demand for more immersive digital technologies in museum exhibitions. The study underscores the importance of participatory design with stakeholders, especially ethnic minority groups, for genuine and compelling cultural representation.

**Originality/value** – This study delves into the potentials of digital technologies in the curation of ethnic minority textiles, particularly for enhancing education and cultural communication. Ethnic textiles and costumes provide rich sensory experience, and they carry deep cultural significance, especially during festive

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occasions. Our findings bridge this gap; they offer insights for museums aiming to deepen the visitor experiences and understanding of ethnic cultures through the use of digital technologies.

**Keywords** Ethnic representation, Ethnic minority artefacts, Digital cultural heritage, Digital curatorial practices, Multimedia learning

**Paper type** Research paper

## Introduction

Digital humanities, since its emergence in the 1960s, has broadened the scope of traditional humanities, introducing the application of computational technologies to fields such as art, archaeology, history and cultural studies (Prospect, 1966). Over the years, museums have adopted these technologies, employing techniques like scanning and the use of replicas to sustainably preserve and present artefacts (Abdoh, 2022).

China's top-down policies, particularly during the 13th and 14th Five-Year Plan periods, have expedited the technological integration in museums, with an emphasis on cultural conservation and enhancing public cultural services. Research by White and Ch'ng (2019) underscored the prevalence of interactive 2D systems, projection systems with storytelling stands and multitouch 3D in leading national museums. While interactive 3D systems, Augmented Reality (AR) and Virtual Reality (VR) are yet to make a distinct impact on cultural heritage curation in China, their adoption has seen a surge in various institutions in recent times. A notable example is the collaboration between the NVIDIA Joint-Lab on Mixed Reality at the University of Nottingham Ningbo China and the Ningbo Museum to digitally reconstruct the Yuan Dynasty's Ningbo Sanjiangkou site. This partnership delivered an interactive role-play game, allowing museum visitors to immerse themselves in historical narratives and fostering a deeper understanding of history (Cheng and Ch'ng, 2020). Such initiatives exemplify China's commitment to marrying cultural heritage conservation with technological innovation.

While museums centred on ethnic minority exhibitions are increasingly using digital tools, there is a noticeable gap in academic research regarding their effectiveness, particularly concerning ethnic textiles and costumes. This study endeavours to fill this gap by examining the use of digital technologies in ethnic exhibitions in Guizhou. Our results suggest that these technologies have enhanced the visitor experience, making it both enjoyable and informative. We advocate for the increased use of immersive technologies to provide a genuine cultural representation and communication, thereby deepening the appreciation and understanding of China's diverse cultures.

## Literature review

According to ICOM's updated definition (2022), museums serve education, enjoyment, reflection and knowledge-sharing by collecting, conserving, researching, communicating and exhibiting both tangible and intangible heritage. Bennett (1995, p. 6) emphasised that museums are involved in "showing and telling" and communicate cultural meanings and values through artefacts. In China, museums serve not only as institutions that nurture and enlighten the public but also as tools for declaring official political discourse (Leung, 2023), as seen in ethnic minority exhibitions.

Chinese museums display ethnic artefacts to educate the public and illustrate the intersection between the official discourse of the "unity within diversity" principle of the Chinese nation and the perspectives of ordinary people. Anthropological objects convey knowledge about the people who created them, effectively representing the cultures they embody within museum settings (Conn, 2010). Various visual mechanisms employed by museums arrange objects for viewing and regulate the overall visual environment to evoke emotional resonance among visitors, fostering profound learning experiences (Greenblatt, 1991). For example, ethnic objects displayed in museums convey the significance of specific hairstyles and clothing within certain ethnic groups, enhancing visitors' understanding and knowledge of diverse cultures (see Plate 1).

Technological integration in museums began in the 1960s, initially for collection management. Digital technologies transformed museums into human-centred spaces in the following decades, enhancing visitor experiences and facilitating interactions with collections (Dierking and Falk, 1998; Hein, 2000; Ch'ng *et al.*, 2019). Digital curation has bridged the perceived gap between visitors and collections by providing digitised objects for exhibitions, education and research (Economou, 1998; Ch'ng and Cooke, 2015; Liestøl, 2021). Research indicates that interactive exhibits captivate visitors longer than traditional displays (Beer, 1987). For example, visitors to Malaysia's Baba Nyonya Heritage Museum understood Peranakan culture and history significantly through digital-physical interactive games (Huang and Ng, 2021). Immersive multimedia technologies like AR and VR have further revolutionised visitor engagement and learning (Khan *et al.*, 2021). As such, Ch'ng *et al.* (2019) argued that digital technologies are deeply influenced by cultures and, in turn, shape cultures to a significant extent.

For ethnic minority exhibitions, digital technologies offer sustainable access to sensitive objects, as illustrated in Loyola University Chicago's May Weber Ethnographic Study Collection (Sun and Nichols, 2021). Moreover, audio and video documentaries have contributed to scholarly understandings of textiles, including their original context and usage (Shaughnessy, 2014). However, ethnic textiles and costumes engage multiple senses instead of being solely experienced visually. These textiles and costumes have also been deracinated from their initial production and used in new contexts, such as institutional settings. Therefore, the use of digital technologies to curate ethnic minority textiles and costumes and enhance visitors' cultural knowledge remains underexplored and requires further research.

In conclusion, digital technologies have become important in museum practices. For ethnic minority exhibitions, leveraging digital technologies engages visitors in exploring diverse cultures and artefacts while preserving and promoting cultural heritage.

### Ethnic minority representation in the Guizhou Provincial Museum

Guizhou, home to 17 recognised ethnic minority groups and several undistinguished minorities, prominently features the Guizhou Provincial Museum (贵州省博物馆) as a vital representation of the province's cultural heritage. Notably, its Miao textiles and silver jewellery collections rank first nationally, making it the ideal site for our study.

The Colorful Guizhou exhibition hall at the museum presents the richness of ethnic minority cultures through textiles, costumes, musical instruments and ceremonial objects. However, the mannequins, encased in glass and elevated on pedestals, appear taller than their actual height (see Plate 2).

In line with technological advancements, especially during the 13th Five-Year Plan period (2016–2020), the museum prioritises the conservation of cultural relics and technological innovation in public cultural services. Visitors have the option to rent audio guides or use their smartphones to access detailed narratives by inputting corresponding numbers from



Source(s): Photos by Xiaolin Sun

Plate 1.  
Ethnic minority  
representation in  
Shanghai Museum  
(left) and Yunnan  
Nationalities  
Museum (right)

the glass displays. The smartphone program, narrated by at least two docents, provides different presentation styles (see [Plate 3](#)).

Positioned near the glass displays, multitouch screens provide in-depth views of the exhibits and their associated documentation. A welcome video shows various ethnic minorities greeting visitors in their languages (see [Plate 4](#)). Documentaries and music players contextualise the exhibitions, allowing visitors to glimpse ethnic minorities' daily lives and festivals and listen to folk songs.

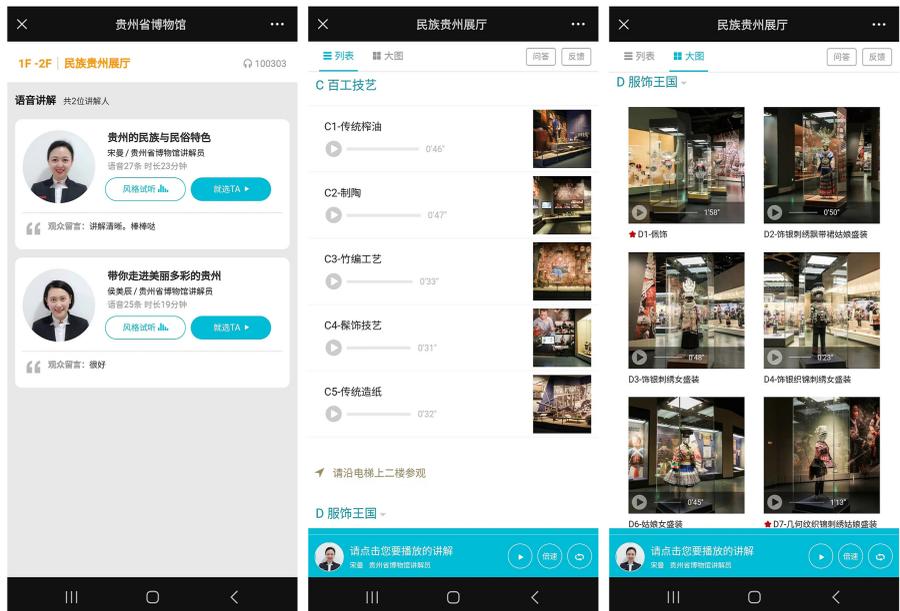
A significant attraction is the three AR systems ([Plate 5](#)). The AR systems display several sets of costumes from different ethnic groups and allow visitors to wear them

**Plate 2.**  
Textile and costumes  
curation at the Guizhou  
Provincial Museum



**Source(s):** Photos by Xiaolin Sun

**Plate 3.**  
The interface of the  
Guizhou Provincial  
Museum's audio guide  
(smartphone mini-  
program version)



**Source(s):** Screenshot by Xiaolin Sun, courtesy of Guizhou Provincial Museum WeChat mini-program (public)



Source(s): Photos by Xiaolin Sun

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in the  
provincial  
museum

**Plate 4.**  
A non-touch digital  
screen playing a  
welcome video



Source(s): Photos by Xiaolin Sun

**Plate 5.**  
Augmented reality  
systems at the Guizhou  
Provincial Museum

virtually. This interactive feature has captured lots of attention, evidenced by numerous visitors sharing their virtual costume experiences on popular Chinese social media platforms, such as TikTok and Xiaohongshu, contributing to the exhibition's popularity (see [Plate 6](#)). While ethnic villages provide opportunities to wear and photograph in ethnic costumes, the geographical dispersion of these groups in Guizhou makes visits logistically challenging. In this context, the AR systems present a convenient and one-stop experience for visitors.

In summary, our observations reveal that while many of the museum's digital technologies are informational and contextual, there are innovative instances of interactive, experience-based technologies. These digital systems substantially augment visitors' engagement levels. Nonetheless, some digital systems occasionally malfunctioned during our observations, pointing to the need to curate these systems.



**Plate 6.**  
Visitors using the AR  
systems

**Source(s):** Photos by Xiaolin Sun

### Methodology

Our research utilised a mixed-methods approach, combining qualitative interviews and quantitative surveys. Through a concise questionnaire, we collected feedback from visitors to understand their experiences. Additionally, interviews with museum professionals and ethnic textile practitioners deepened our understanding of ethnic minority cultures.

#### *Interviews*

We engaged with museum professionals at the Guizhou Provincial Museums, including docents, curators and conservators. We also gained insights from the founder of the National Costume Museum of Miao Region Stories in Guiyang (贵阳市苗疆故事民族服饰博物馆) and from ethnic textile practitioners.

The interviews with museum professionals were divided into four parts:

- (1) *Object collection and catalogue:* This focused on the museum's collection, particularly ethnic minority textiles and costumes, their acquisition methods and the participation of ethnic minority representatives in the cataloguing process.
- (2) *Curatorial practices:* Inspired by Morse *et al.* (2013) and Godwin (2014), this part delved into exhibition designs, object selection and challenges faced in the curatorial process.
- (3) *Educational engagement:* This assessed the effectiveness of current ethnic exhibitions in promoting learning, covered the scope of educational projects and discussed the participation of ethnic minority communities in educational initiatives.
- (4) *Digital strategies:* The final part addressed the museum professionals' contribution to present digital approaches and their visions for future strategies.

#### *Questionnaire*

We design a brief questionnaire, expected to be completed in 5–10 min, divided into three sections:

- (1) *Demographics and preferences:* This included four questions about participants' background information and museum visit preferences.
- (2) *Experience and learning:* This section evaluated visitor interactions with digital technologies and their knowledge acquisition of ethnic cultures. Participants gauged their agreement or disagreement with statements on a seven-point Likert scale, using references from Huang and Ng (2021), Khan *et al.* (2021) and Sugiura *et al.* (2019).

- (3) *Future digital expectations*: This section gauged the visitor expectation regarding future digital enhancements in the museum. Ethnic curation  
in the  
provincial  
museum

Given the majority of respondents were Chinese the questionnaire was translated into Mandarin. A detailed list of questions is in [Table 1](#).

### Data analysis and findings

Before the field trip, the university's ethics board approved our research. All participants read and signed the consent form before participating.

#### *NVivo thematic analysis*

In the Guizhou Provincial Museum, we held two conversations totalling over two hours. A conversation with two docents was about 40 minutes, and another conversation with curators and conservators was 80 minutes. These conversations were recorded, transcribed, translated and then analysed using Nvivo (see [Figure 1](#)).

The Guizhou Provincial Museum, since its establishment, has expanded its ethnic minority collection through donations, field collections and purchases. To maintain inclusivity, ethnic minority individuals assist in cataloguing, avoiding the imposition of authoritative representation. Mainstream display methods include hanging textiles on walls or using mannequins. Digital enhancements enrich visitors' experiences and offer additional information. The museum frequently runs educational projects on ethnic textiles and costumes, fostering non-formal learning opportunities. Committed to amplifying its digital capabilities, the museum's focus is on crafting immersive encounters that deeply engage visitors in ethnic artefacts and cultures.

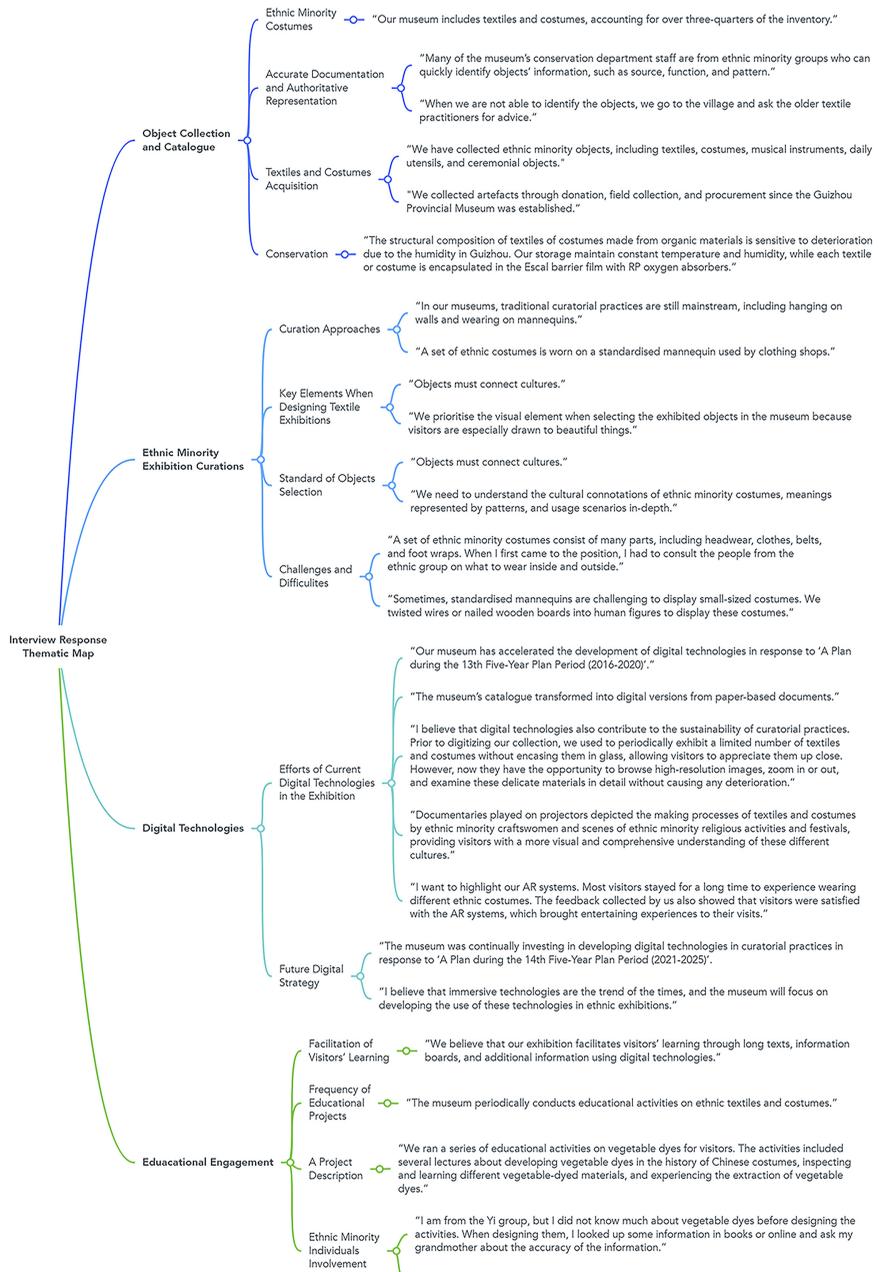
#### *Questionnaire data visualisation and findings*

Through a simple random sampling method, we invited 33 visitors at the end of the exhibition hall. We analysed the data using SPSS and R-statistics for qualitative insights, with respondents' demographics detailed in [Table 2](#).

Parts	Sub-category	Questions
One	Visitor's demographics	Q1 What is your name? (Optional)
		Q2 How old are you?
		Q3 What is your gender?
		Q4 What kinds of museums do you usually visit? (Select two options.)
Two	Experience visiting the museum	Q5 How many times did you see digital technologies in the exhibition?
		Q6 How many times did you use technology in the exhibition?
	Knowledge gained	Q7 I enjoyed the textiles exhibition at the Guizhou Provincial Museum
		Q8 I have learned new things about textiles (objects) from the exhibition
		Q9 I have learned new things about ethnic minority cultures from the exhibition
Inspiration	Q10 I hope to visit ethnic minority communities after visiting the exhibition	
Three	Future expectations	Q11 If the museum attempted to add new digital devices in the exhibition, as a visitor, what technologies would you like to see? (Select any or all of the following)

**Table 1.**  
The Guizhou provincial museum textiles exhibition questionnaire

**Source(s):** Table created by Xiaolin Sun



**Figure 1.**  
Interview response  
thematic map

**Source(s):** Figure created by Xiaolin Sun using MindMaster

Our sample included 16 males and 17 females, mostly aged between 18–34. Almost half ( $n = 16$ ) preferred history museums, followed closely by those ( $n = 15$ ) favouring general museums. About a third ( $n = 11$ ) liked art museums, with fewer ( $n = 6$  and  $n = 7$ ) choosing science and technology museums and natural history and natural science museums, respectively.

Regarding their museum visit, we assessed their perception of and interaction with digital technologies. As illustrated in Figure 2, five respondents saw these technologies 1–3 times. Over half, or precisely 17, encountered them 4–6 times. Another two respondents saw the technologies 7–10 times, while seven respondents encountered them more than 10 times. However, two respondents reported they did not notice any presence of digital technologies.

As for engagement with digital technologies, nearly half ( $n = 16$ ) of respondents used technologies 1–3 times. Another 11 used them 4–6 times, and only one respondent reported engaging with them more than 10 times.

In addition, we examined the relationship between gender and age concerning their perception of and interaction with digital technologies. Figure 3 provides insights into how these demographics differ in their encounters with these technologies. There was a minimal difference between males and females in our sample. However, when it came to age, the majority of respondents between 18–24 reported noticing digital technologies 4–6 times during their visit. In contrast, among those aged 25–34, three noticed the technologies 4–6 times, while five reported noticing them over ten times. The frequency varied for participants aged 35–44, but in the 45–54 age group, two reported noticing the technologies 4–6 times.

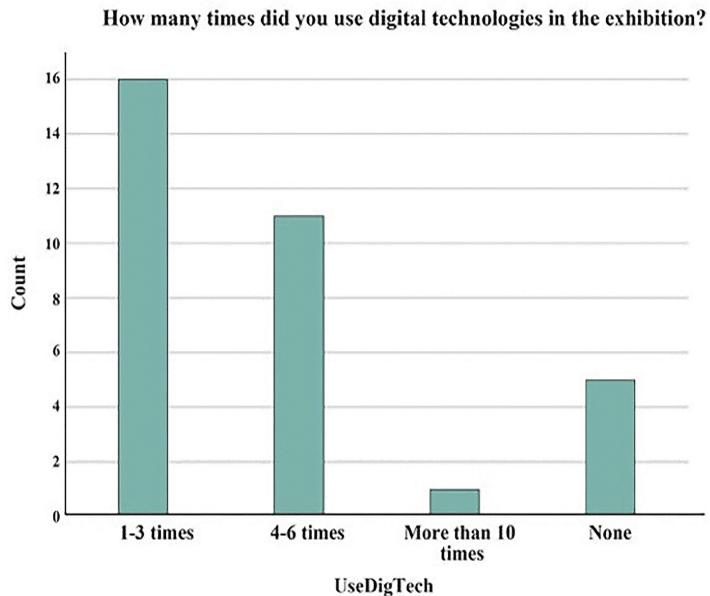
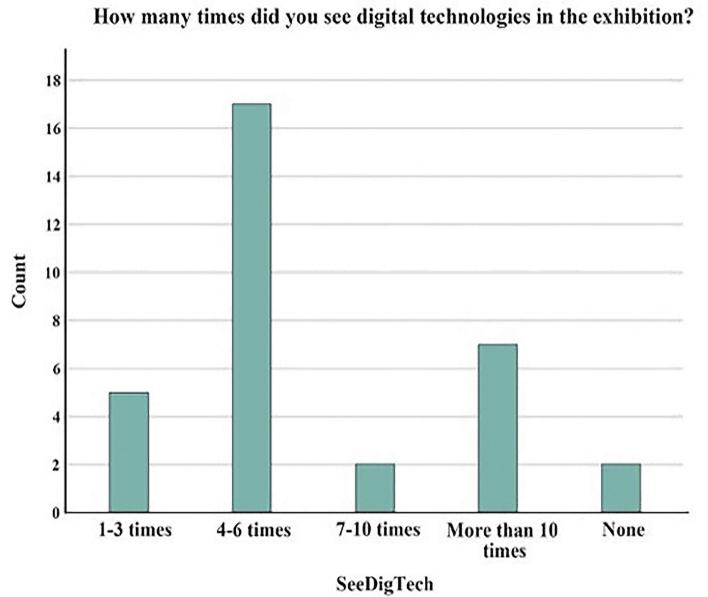
When we analysed their interaction with digital technologies, as depicted in Figure 4, a pattern emerged. Many female participants reported using the digital technologies 1–3 times, with nearly a quarter of them ( $n = 4$ ) using them 4–6 times. For males, seven have reported using the technologies 1–3 times, another seven reported using them 4–6 times and one individual interacted with them over ten times. From an age perspective, half of the participants ( $n = 6$ ) between 18–24 used the digital features 1–3 times, with four from this age group using them 4–6 times. Those aged 25–34 showed a balance in usage between 1–3 times ( $n = 6$ ) and 4–6 times ( $n = 5$ ). Respondents over 35 primarily interacted 1–3 times. It is evident that the younger age group, especially those between 18–34, showed higher engagement with digital contents than the older age-groups.

When assessing visitor enjoyment of the exhibition, most learned towards a positive experience on our Likert scale. Over three-fifths ( $n = 20$ ) indicated that they enjoyed their visit, while a smaller fraction ( $n = 6$ ) had a negative perception (see Figure 5). We also delved into the influence of digital technologies on enjoyment (see Figure 6). Most visitors who frequently engaged with digital technologies, such as those using them 4–6 times, found their visits more enjoyable. This trend was evident as almost three-quarters ( $n = 8$ ) of this group appreciated the experience. Similarly, the majority ( $n = 10$ ) who used digital tools between 1–3 times also gave a positive rating. However, those who did not interact with the technologies

Characteristics	Category	Number	Percentage
Gender	Male	16	48.48
	Female	17	51.52
Age	18–24	13	39.39
	25–34	12	36.36
	35–44	5	15.15
	45–54	3	9.09
Total		33	100

Source(s): Table created by Xiaolin Sun

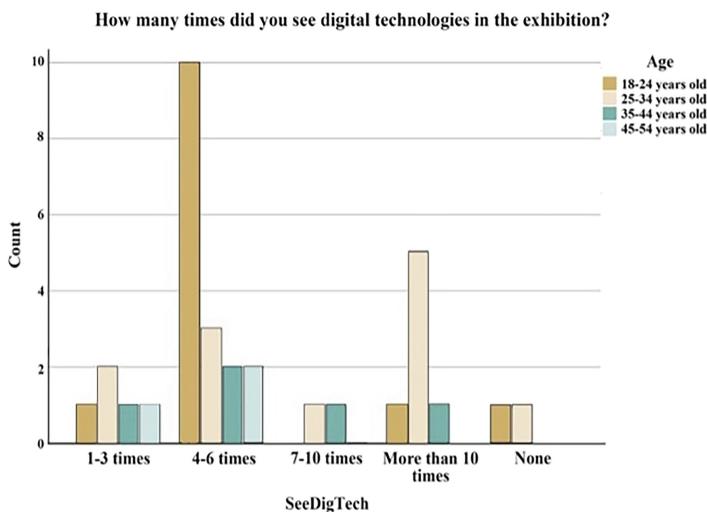
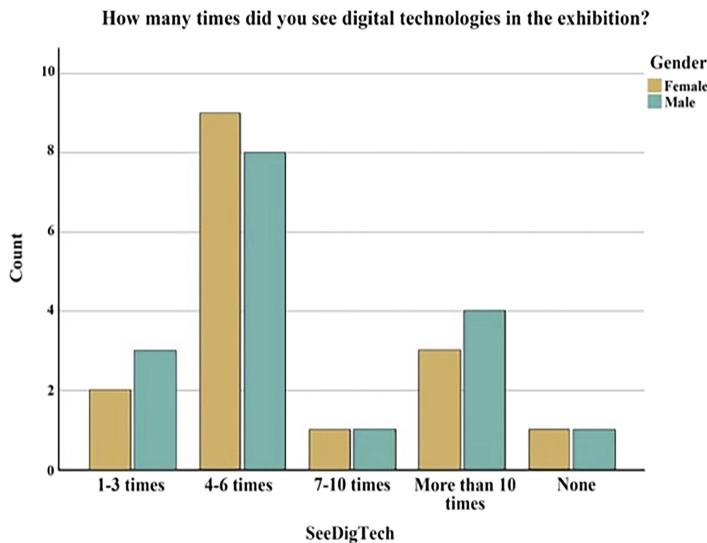
**Table 2.**  
Respondents'  
demographic profiles



**Figure 2.**  
Bar charts showing how many times digital technologies were seen and used by visitors

**Source(s):** Figures created by Xiaolin Sun using SPSS

were less impressed, with only one-fifth finding the exhibition enjoyable. One outlier, who used digital technologies for over 10 times, was not included in the analysis. Spearman's rank correlation was computed to assess the relationship between the number of times visitors



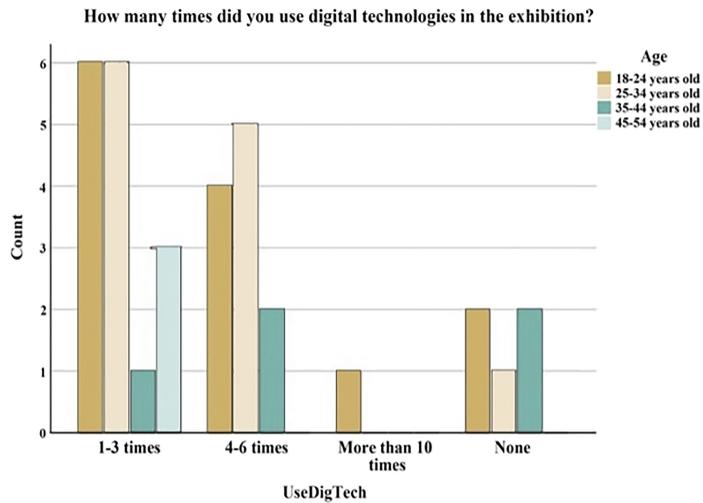
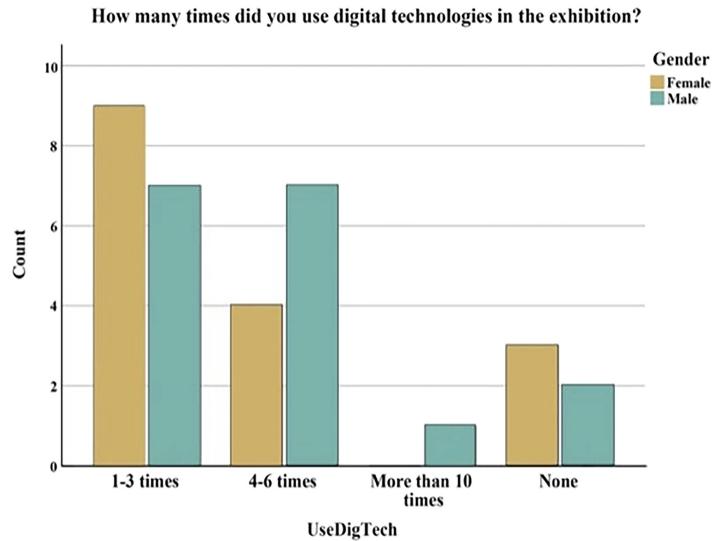
Source(s): Figures created by Xiaolin Sun using SPSS

Figure 3.  
Bar charts showing  
how many times digital  
technologies were seen  
by visitors (right by  
gender, left by age  
groups)

used digital technologies and their enjoyment. There was no significant correlation between the two variables,  $r(30) = 0.226, p = 0.213$ . Thus, the frequency of using digital technologies does not appear to have influenced visitor enjoyment.

In summary, our study assessed digital technology visibility, usage and subsequent visitor enjoyment at the museum. The data shows that most visitors noticed and used these technologies, which enhanced their exhibition experiences.

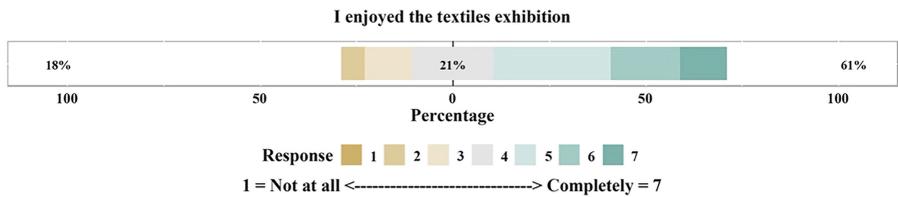
Furthermore, we assessed how digital technologies in the exhibition impacted visitors' understanding of ethnic minority textiles, costumes and cultures. Figure 7 shows that over half of the respondents ( $n = 19$ ) felt they had learned about ethnic textiles and costumes, yet none felt they fully grasped the entire exhibition. A small portion, less than a fifth, felt they



**Figure 4.** Bar charts showing how many times digital technologies were used by visitors (right by gender, left by age groups)

**Source(s):** Figures created by Xiaolin Sun using SPSS

**Figure 5.** Respondents' self-evaluation of the enjoyment of the exhibition (left: negative responses, right: positive responses)

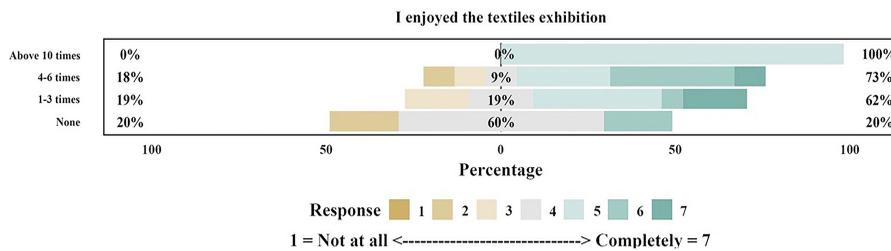


**Source(s):** Figure created by Xiaolin Sun using R

did not learn much. While the exhibition's curatorial practices do promote knowledge acquisition, there is a notable gap in cultural understanding. Over one-third ( $n = 12$ ) had a negative response about gaining insights into the culture, with twice as many indicating that they did not learn anything about the objects in the exhibition.

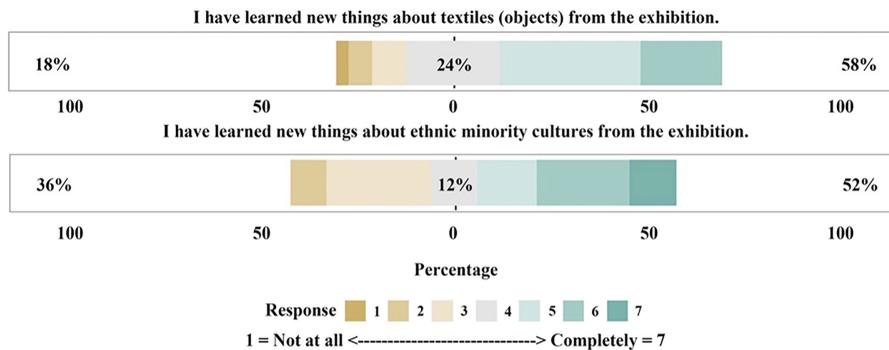
Exploring further, we looked into the relationship between the use of digital technologies and knowledge gained (see Figures 8 and 9). Spearman's rank correlation was computed to assess the relationship between the number of times visitors have used digital technologies and the knowledge they acquired. In terms of knowledge about textiles (objects), there was a positive correlation between two variables,  $r(30) = 0.435, p = 0.013$ . The extent to which visitors frequently used digital technologies positively influenced their knowledge gain about textiles (objects). Similarly, Spearman's rank correlation suggested a positive correlation

## Ethnic curation in the provincial museum



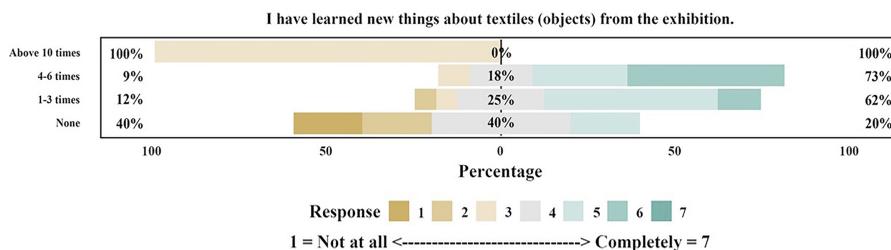
Source(s): Figure created by Xiaolin Sun using R

**Figure 6.** Respondents' self-evaluation of their enjoyment of the experience using the number of times they used digital technologies as a variable



Source(s): Figure created by Xiaolin Sun using R

**Figure 7.** Knowledge acquisition regarding ethnic textiles (objects) and cultures



Source(s): Figure created by Xiaolin Sun using R

**Figure 8.** Knowledge acquisition regarding ethnic textiles (objects) using the number of times respondents used digital technologies as a variable

between the number of times visitors used digital technologies and their acquired knowledge about ethnic minority cultures,  $r(30) = 0.390, p = 0.027$ . Frequent use of digital technologies enhanced visitors' understanding of minority cultures.

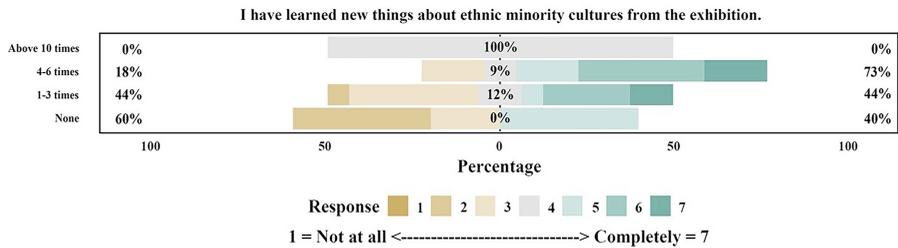
The data suggests that frequent users of digital technologies, especially those interacting 4–6 times, had a more positive learning experience about ethnic textiles and costumes. In contrast, those less engaged with digital technologies, or not at all, have reported that they have not gained substantial knowledge. This trend was even more pronounced when it came to the understanding of ethnic cultures.

In conclusion, while the Guizhou Provincial Museum does a commendable job showcasing ethnic minority artefacts, and visitors do learn about ethnic textiles and costumes, there is a need to enhance the depth of cultural understanding. Digital technologies have a clear role in augmenting the learning experience, but there is scope for refining their educational approach.

We measured the exhibition's impact on inspiring continued learning about ethnic minority cultures. As shown in Figure 10, nearly 80% of participants ( $n = 26$ ) were motivated to visit ethnic minority communities post-exhibition. In contrast, less than 10% ( $n = 3$ ) felt otherwise, indicating the exhibits' profound influence. We also investigated whether the use of digital technologies contributed to visitors' curiosity about visiting ethnic minority communities. However, according to Spearman's rank correlation, there was no significant correlation between the use of digital technologies and the desire to visit ethnic minority communities,  $r(30) = 0.168, p = 0.358$  (see Figure 11). Therefore, the exhibition significantly arouse visitors' interests in ethnic minority communities, but digital technologies do not appear to influence this interest in this particular case study.

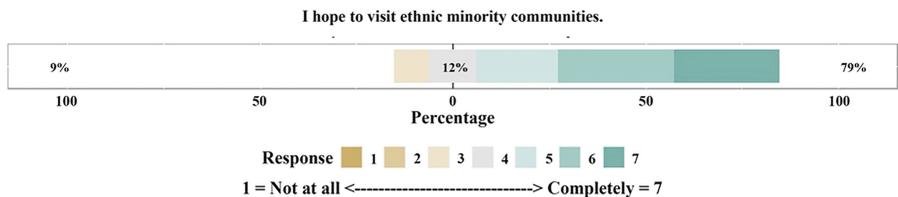
Lastly, in our exploration of visitors' preferences for future digital technologies, Figure 12 reveals a clear inclination towards more immersive experiences. Over three-quarters of respondents ( $n = 25$ ) voiced interest in integrating VR systems into the exhibition. Holographic projection technology was favoured by nearly 70% ( $n = 23$ ), while richer AR content based on existing systems garnered interest from roughly two-fifths ( $n = 13$ ) of

**Figure 9.** Knowledge acquisition regarding ethnic cultures using the number of times respondents used digital technologies as a variable



**Source(s):** Figure created by Xiaolin Sun using R

**Figure 10.** Desire to visit ethnic minority communities after the exhibition



**Source(s):** Figure created by Xiaolin Sun using R

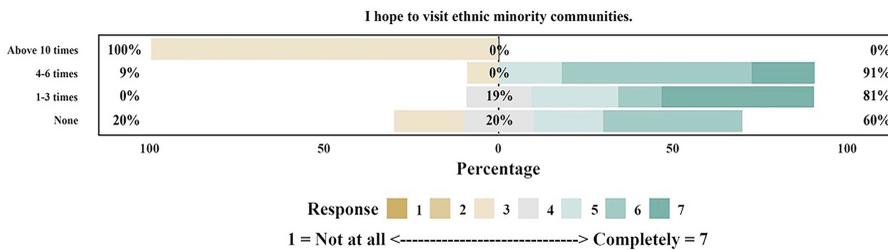
respondents. Mobile solutions, such as a WeChat mini program or mobile application, were sought by a third. However, more traditional digital systems, like audio guides and digital screens, garnered less enthusiasm, chosen by under a third ( $n = 10$ ) and just over 12% ( $n = 4$ ) of respondents, respectively.

To summarise, our study delved into visitors' enjoyment of the ethnic exhibition, assessed their comprehension of ethnic artefacts, including textiles and costumes and their broader understanding of the cultures showcased. We also probed the influence of digital technology utilisation on these perceptions. Moreover, we gathered perspectives on the prospective adoption of advanced digital technologies in museum settings.

## Discussions

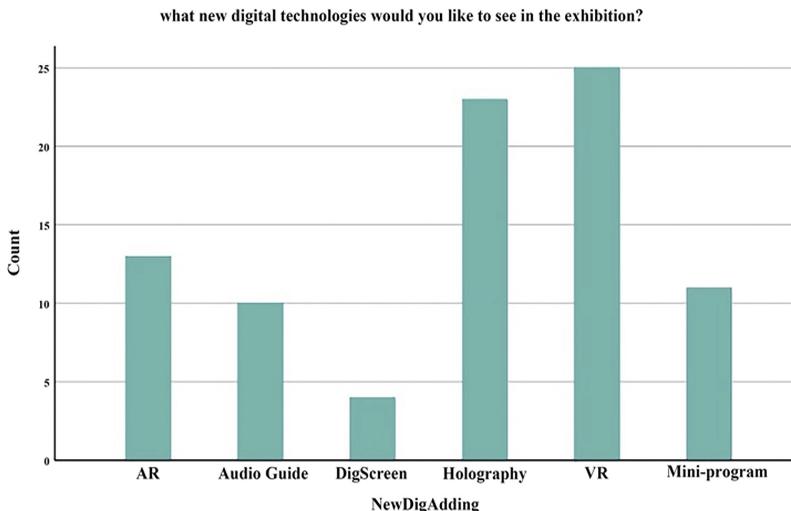
China is home to an ethnic minority population of nearly 125 million (National Bureau of Statistics of China, 2021), and the museums serve a multifaceted role. They not only display ethnic artefacts to emphasise their importance in the vast tapestry of Chinese culture but also further the notion's official discourse of unity within diversity.

There seems to be a priority placed on tangible cultural heritage, as displayed in the museum. Perhaps the intangible aspects of living communities were a challenge to display



Source(s): Figure created by Xiaolin Sun using R

Figure 11. Desire to visit ethnic minority communities after the exhibition, using the number of times respondents used digital technologies as a variable



Source(s): Figure created by Xiaolin Sun using SPSS

Figure 12. Participants' choices of potential new digital innovations at the museum

within the museum, which we thought must carry equal weight for cultures to be more completely represented. This predominant focus on the tangible might be influenced by the longstanding tradition of historical materialism in China, where material culture serves as scientific evidence, constructing a curatorial framework that is both theoretical and ideological. [Garrett \(1994\)](#) explained dress codes in China, going back to the Zhou Dynasty, have signified social status. Chinese scholars specialising in ethnic minorities also interpreted curatorial philosophies according to the narratives of ethnic minorities and their research. For example, [Zeng \(2020\)](#) believed that ethnic minority textiles and costumes symbolise their culture; she indicated that these items highlight the customs, art traditions, religious beliefs and ways of living of various minorities. Similarly, [Liu \(2008\)](#) argued that textiles and costumes are a “wordless” history book that records the cultures of various ethnic minorities and constructs their self-identities.

In the realm of curatorial practices, the widespread use of mannequins, miniatures and figurines adorned in ethnic wear with distinct hairstyles is evident across China. This approach can trace its roots back to the 19th century, when museum practices across various disciplines utilised such mannequins to depict natural and cultural habitats ([Haraway, 1984](#)), and echoes [Bennett’s \(2007, p. 121\)](#) idea of “civic seeing,” where museums conduct “civic lessons” to guide visitors how things are arranged to be viewed through specific visual strategies. Although Bennett’s studies primarily focused on Western museums of the 19th and 20th centuries, the concept can be extended to China.

However, the curatorial practices of ethnic minorities in Chinese museums have faced criticism. For example, [Varutti \(2014\)](#) believed that a metaphorical relationship exists between the mannequins and the ethnic groups they represent, claiming that the small figurines reflect the subordinate position of China’s ethnic minorities to the Han group. [Varutti \(Ibid.\)](#) further claimed that the mannequin, with standardised features and static body postures, is distinguished by diverse costumes and headdresses, and that it depersonalises objects to universalise representations and strengthen the discourse that they are all Chinese people. [Macdonald \(2015, p. 485\)](#) evaluated [Varutti’s](#) arguments, which she stated, were built on Western viewpoints of museum debate that “attention to the politics of representation is associated with a challenge to museums, and established authorities”. [Macdonald \(Ibid., p. 486\)](#) suggested that the challenge is to operate more reflexively and democratically, questioning habitual inclusion and exclusion and seeking to reduce the “top-down” approach. While ethnic minority exhibitions are essential for promoting official political discourse, some curatorial practices should not be interpreted as having a political intention. This is strongly confirmed in our interviews. The curators at the Guizhou Provincial Museum mentioned that although the phenotypic characteristics of ethnic minorities in Guizhou cannot be fully used to distinguish one from another, their choice of standardised mannequins was simply due to budgetary constraints. To put it bluntly, their funding was limited to warrant the use of mannequins of variable sizes. Therefore, they have deliberately chosen to display small-sized costumes by wrapping wire or nailing wooden boards into small human figures instead of showing hierarchical differences between ethnic groups, as opposed to prior interpretations seen in the literature.

Moreover, [Lévi-Strauss \(1966\)](#) highlighted the limitations of presentation, suggesting that certain vital attributes get lost in mimicry. This perspective did not directly address the topic of mannequins but is relevant when considering mannequins adorned in ethnic costumes. Ethnic minority textiles and costumes were deracinated from their initial production and used in new contexts, such as institutional settings, resulting in a loss of the aura of the original. Therefore, both reproduction and representation are deeply deficient.

In summary, the Guizhou Provincial Museum, while rooted in traditional displays, has embraced in digital era. The objective is to enhance the visitor experience while maintaining the sustainability of these practices. However, the integration of digital technologies in the

curation of ethnic minority cultures is nascent. The academic circles have yet to extensively discuss the effectiveness of digital technologies in facilitating visitor learning, especially regarding textiles, costumes and the intangible cultural aspects of ethnic minorities. Our research aims to bridge this gap, offering initial insights into the potential benefits of technology integration in ethnic exhibitions.

In the questionnaire, we investigated the perception of and interaction with digital technologies in the exhibition. Gender disparities emerged, with male respondents showing a slightly stronger affinity for these technologies compared to female respondents. While most female respondents have engaged with these technologies 1–3 times, a majority of males did so over 4 times. Younger participants demonstrated a heightened awareness of and willingness to engage with digital technologies compared to their older counterparts. This trend aligns with Prensky's (2001) concept of digital natives, which refers to the generation that has grown up in a digital and media-rich environment, and contrasted against digital immigrants who only learned digital technologies later in life.

Published research in education studies has demonstrated that digital natives and digital immigrants show varying levels of acceptance and accessibility to digital technologies in learning environments (Prensky, 2001; Gaston, 2006; Bennett *et al.*, 2008). Digital natives are enthusiastic consumers of new technologies (Jewitt, 2012; Shaw and Krug, 2013). They have an intuitive inclination toward visuals, audio and videos for quick information retrieval, favouring these over text-based formats (Aziz *et al.*, 2019). This preference was further validated by Ch'ng *et al.* (2019) in their experimental study on the use of VR in cultural heritage. The study confirmed the visually-oriented modes of preferred learning approaches among the younger generation. For digital natives, these digital technologies seamlessly align with their learning patterns and enhance effective learning.

On the other hand, digital immigrants are accustomed to a slower learning pace in the use of technologies in museums. They tend to process information in a linear manner (Autry and Berge, 2011). Our observation revealed that older museum attendees have often shown a preference for content with longer texts. Previous studies have indicated that older adults require more time to learn how to use digital technologies (Kelley and Charness, 1995), coupled with a longer time spent sourcing digital information (Mead *et al.*, 2000; Sjölander *et al.*, 2003). During our visit, we observed instances where a middle-aged woman spending considerable time with an AR system exemplified these challenges.

Therefore, for museum curators striving for inclusivity, addressing the varying perceptions of and interactions with digital technologies across age groups is imperative. In ethnic minority exhibitions, weaving in dynamic multimedia elements offers playful and responsive experiences. These elements can effectively engage visitors from diverse cultural backgrounds and foster a deeper understanding of the exhibited heritage. Additionally, incorporating feedback from digital immigrants when crafting digital technologies can facilitate the creation of user-friendly human-computer interfaces that cater to the needs of not only young digital natives but also middle-aged and older adults, paving the way for a universally appealing museum experience.

Visitors often select museums as learning venues (Falk and Dierking, 2018). This learning predominantly happens through non-formal and informal avenues. Originating in the 1960s, these methods were tailored to cater to adult learners beyond the confines of formal schooling (Dudzinska-przesmitzki and Grenier, 2016). Non-formal learning encompasses initiatives like docent training programs and educational lecture series, providing structure within the flexible museum environment. On the other hand, informal learning represents the unguided and self-directed learning experiences that visitors undergo while exploring museum exhibits.

A prime example is the Guizhou Provincial Museum. It provides learning opportunities like periodic educational activities and lectures, allowing visitors to immerse themselves in

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the exhibition through detailed text introductions and additional information displayed on multitouch screens. This hands-on experience does not necessarily rely on continuous guidance from museum personnel.

It is noteworthy that individual museum learning experiences are moulded by various personal factors, ranging from individual motivations and interests to prior knowledge and past experiences (Falk and Dierking, 2018). The design and layout of exhibitions play a crucial role in this learning journey. The strategic placement of labels, the spacing between objects and even the size of objects can greatly influence visitors' learning experience (Bitgood, 2000). Labels, for instance, do not just offer information; they anchor the visitor experience, and serve as platforms that stimulate and solidify their learning (Falk, 1997). From our observations, a significant number of visitors have been seen actively engaging with these labels, reflecting their utility.

Simon (2010) further divides visitors' preferences, noting that while some are inclined towards static exhibitions that provide authoritative knowledge, others gravitate towards interactive platforms that challenge their understanding. Cater to the latter, the Guizhou Provincial Museum utilises multitouch screens, providing a close-up view of textiles and costumes.

Moreover, our study shed light on the transformative potential of digital technologies in enhancing museum visits, and the results are aligned with previous scholarly findings. The value of digital technologies, both educational and entertaining, is evident in bolstering visitor engagement, stimulating motivation and creating an entertaining learning environment (Kiili *et al.*, 2012; Mamur *et al.*, 2020; Pietroni, 2019). The concept of narrative engagement in exploring how storytelling and narrative elements can be effectively integrated into immersive experiences has been studied (Leow and Ch'ng, 2021). Their work demonstrated the potential of utilising narratives to convey historical and cultural knowledge to the audience, and enriching their learning experiences in museums. Similarly, Popoli and Derda (2021) have mirrored these sentiments, highlighting the profound emotional connections and lasting impressions formed through immersive storytelling and fostering a deeper appreciation of cultural heritage and history.

However, it is essential to note that the infusion of digital technologies in ethnic exhibitions is in its embryonic stage. There is an evident gap and opportunity for more innovative and audience-centric approaches in the design and implementation. Yet, from our research, the preliminary digital strides taken by the museum promise an enriched, informative and enjoyable experience for visitors.

According to the respondents' feedback, most visitors enjoyed their exhibition experience. As Cuno (2014) suggested, encyclopedic museums can foster curiosity about the world by comparing artefacts from different cultures and periods. This aligns with our data, where respondents expressed a desire to further delve into ethnic minority cultures. Intangible cultural heritage, which encompasses ethnic craftsmanship, performing arts and rituals, is central to understanding a culture's essence (Zhang *et al.*, 2019). Growing visitor interest in these communities, driven by museums, can spur tourism, which in turn can provide much-needed support for these cultures and their traditions (Robinson and Picard, 2006).

Beardslee (2016) observed that intangible cultural heritage practitioners, pivotal in maintaining these traditions, might not always gain economically (Su *et al.*, 2020). Without financial support, their passion and motivation may diminish, leading them to seek more profitable means of livelihood (Kim *et al.*, 2019). Yet, the rise in tourism, as evidenced by textile practitioner Ms Defang Wu's (伍德芳) account of increased visitors to her village, offers opportunities. Tourists keen to learn about the production and use of ethnic minority textiles and costumes in their original environment can bolster the local economy. Some practitioners who had pursued alternative livelihoods have returned to work related to intangible cultural heritage. Thus underpinning the sustainability of intangible cultural heritage.

During the questionnaire, one respondent underscored the need for more immersive digital technologies in exhibitions, suggesting interactivity, storytelling and narrative engagement. VR

stands out for its immersive capabilities, enhancing audience presence and engagement (Alexander, 2017; Ch'ng *et al.*, 2019). In terms of ethnic exhibitions, this technology allows a better understanding of how costumes and textiles were originally used in their contexts. Holographic projections were another popular suggestion, likely inspired by recent media showcases of this technology. Studies by Caggianese *et al.* (2018) and Pietroni (2019) indicate that holographic projections can attract visitors' attention, bridge the gap between virtual and authentic artefacts and display the original context of objects. The museum could consider employing holographic projections to showcase the original environments of ethnic minority communities in the exhibition. Additionally, AR systems were also of interest, though respondents felt the existing systems had limited content and more extensive content was necessary.

Furthermore, we encountered a conflict between ethnic minority groups and memory institutions, such as museums, in their effort to promote cultural diversity by presenting multiple perspectives. Liu (2008) detailed the profound attachment ethnic groups in Guizhou have to their textiles, many of which were passed down through generations. Wu's emotional reaction to seeing her work exhibited, and a craftswoman's distress after selling her textiles underscores these artefacts' deep-seated sentiment. The situations should let us contemplate whether presenting textiles more immersively, such as through VR, potentially induces feelings of cultural identity loss among these ethnicities. Manžuch (2017) suggested that memory institutions should involve community members as equal partners in digital innovations, underscoring the importance of integrating their perspectives into future projects.

Our study, while offering valuable insights, is not without its limitations. The most pronounced one is our sample size. With 33 participants, while this may be adequate for identifying pronounced effect sizes, it restricts deeper exploration into specific subgroups. This limitation hindered our ability to delve deeper into how different variables influenced respondents' exhibition experiences in terms of enjoyment, knowledge acquisition and inspiration. Furthermore, the use of a simple random sampling approach to invite respondents led to an uneven participant distribution across various groups. Such a discrepancy might impact the generalisability of the findings, given that representation from some groups might not align with their actual presence or experiences. These factors should be kept in mind when interpreting the results, and future research might benefit from a more strategic sampling approach to yield a broader understanding of visitor experiences in exhibitions.

## Conclusion

Ethnic minority groups in China offer rich histories and unique cultures. Museums have begun showcasing these through the display of textiles, costumes and the integration of digital technologies in curatorial practices. Our study, based on feedback from both audiences and museum professionals, indicates that most visitors are satisfied with their exhibition experience, gaining insight into ethnic costumes, textiles and cultures. However, there is an evident desire among audiences for more immersive digital museum experiences.

Given the recent announcement of the "A Plan for the Preservation of Cultural Relics and Related Technological Innovation during the 14th Five-Year Plan Period (2021–2025)", museums have significant potential to enhance visitors' education. Key to this enhancement is the involvement of ethnic minority groups as core stakeholders in exhibition design, ensuring genuine representation and cultural conveyance. The incorporation of advanced digital technologies, like holographic projectors, AR and VR, can significantly enhance visitors' learning experiences, making their interaction with cultural heritage both enjoyable and immersive.

In conclusion, by integrating digital technologies and partnering with ethnic minority groups, museums can pave the way for deeper cultural understanding, richer visitors' experiences and the effective preservation of China's diverse ethnic heritage.

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Ethnic curation  
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### Further reading

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Xiaolin Sun is a Ph.D. candidate at the School of International Communications, the University of Nottingham Ningbo China. Working across cultural anthropology, museum studies and digital heritage, Xiaolin Sun is researching to examine an intersection between digital technologies and traditional ethnic minority artefacts. During his academic journey, Xiaolin Sun participated in several conferences to present his research and was invited to Sichuan Fine Arts Institute to give two lectures related to arts and advanced digital technologies. Prior to Nottingham, Xiaolin Sun worked as a research assistant at the May Weber Ethnographic Study Collection and initiated a digital humanities research project, *East Asian Textiles*, during his master's studies. He earned a B.A. from Sichuan Fine Arts Institute, where he contributed to *China Arts and Crafts Collection – Chongqing*, an encyclopaedia recording artistic activities in Chongqing, China. Xiaolin Sun is affiliated with the Digital Heritage Centre and the NVIDIA Joint-Lab on Mixed Reality. Xiaolin Sun is the corresponding author and can be contacted at: [xiaolin.sun@nottingham.edu.cn](mailto:xiaolin.sun@nottingham.edu.cn)

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