

Culture and Technology: Visitor Experiences at the Palace Museum and China Science Museum

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Abstract

The Palace Museum emphasises historical and cultural preservation, whereas the China Science and Technology Museum focuses on interactive engagement and technological innovation. This research used text-mining techniques to analyse 8,243 visitor comments to identify key differences influencing perceptions of museum experience satisfaction. Keyword extraction, semantic network analysis, and LDA topic modelling were conducted. The Palace Museum visitors typically addressed the historical atmosphere, crowd density, and guide services. In contrast, the science museum visitors highlighted interactive exhibits, family-friendliness, and educational value. These findings may inform museum design strategies by balancing authenticity with interactivity.

Keywords: Museum experience; Text mining; Visitor perception; Cultural vs. Science museums

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1.0 Introduction

1.1 Background and Significance

As a symbol of Chinese culture, the Palace Museum embodies a wealth of history and cultural heritage, and its visitor experience is primarily centred on historical ambience and cultural connotations. In contrast, the China Science Museum emphasises interactivity and education by employing modern technological means to enhance visitor engagement. Cultural museums and science museums exhibit distinct characteristics in terms of visitor experience, which are crucial for understanding visitor needs and improving service quality (Mao et al., 2023).

Comparative studies on the visitor experiences of these two types of museums remain relatively scarce, particularly regarding the differences between them (Yi, 2024). This study will employ text-mining techniques to analyse large-scale visitor reviews to identify the core attractions and service pain points of museum types. This data-driven approach can reveal in greater detail implicit patterns that may be overlooked in traditional survey research. It provides a scientific basis for museum service design and visitor experience strategies.

1.2 Research Objectives and Questions

This study aims to analyse the differences in visitor experiences between the Palace Museum and the China Science Museum based on comments from travel platforms. The research questions will first focus on determining which aspects are most valued by visitors under the distinctly different exhibition styles of cultural heritage and technological innovation and on exploring how these focal points are associated with visitor satisfaction. The study will further identify the main dimensions of visitor needs that affect experience satisfaction.

By achieving these objectives, the study contributes to a deeper understanding of how different museum environments influence visitor perception and engagement. Ultimately, this study lays the foundation for further research into optimising the museum experience by integrating cultural and technological elements.

1.3 Limitations of the Research

Although this study attempts to reveal the similarities and differences between different types of museums in terms of the visitor experience, there are still some limitations of the study that should not be ignored. On the one hand, all the data in the study are derived from voluntary comments from visitors on online platforms. These reviews are highly subjective user-generated content (UGC), which is highly influenced by individual emotions, background knowledge, and expectations of the museum. On the other hand, although the Palace Museum and the China Science Museum are highly typical in their respective fields, the visiting experience of different cultural or technological museums may have their uniqueness.

2.0 Literature Review

2.1 Museum Visitor Experience Theory

Studying the visitor experience is becoming increasingly crucial as museums transform from traditional cultural storage places to social places that provide educational and leisure experiences. The museum visitor experience is a complex, multidimensional process that involves multiple aspects of service, cognition, education, and interaction (J. H. Falk, 2016). Some researchers have argued that the visitor experience can be analysed through social, cognitive, and environmental perspectives, which help to understand visitor behaviour and provide a framework for managing museum services (Goulding, 2000). Falk & Storksdieck's (2005) Contextual Model of Learning, Visitor experiences are influenced by personal, sociocultural, and physical contexts, encompassing prior knowledge, social interactions, and the museum's spatial environment. This framework offers a dynamic, layered understanding of museum engagement. At the same time, visitors' individual motivations, group identities, and decision-making processes also play an essential role in the experience (Recupero et al., 2019). The researcher conducted a review of the literature on the visitor experience in museums up to the year 2024, identifying nine key research areas: sustainability, mixed reality, social media, accessibility, emotions, co-creation, interpretation, exhibitions, and museum visitor experience and engagement (Nigatu et al., 2024).

2.2 Text Mining in Museum

Visitors' experiential expectations include various types, such as relaxation, cultural entertainment, personal identity, historical reminiscence, and escapism (Sheng & Chen, 2012). Text mining in service management focuses on social media analysis, market analysis, and competitive intelligence (Annechini et al., 2020). Visitors' experiential expectations and cognitive responses show significant differences in different contexts of market heterogeneity (Ruiz-Alba et al., 2019). Researchers text-mined TripAdvisor reviews to identify influences on museum visitors' behavioural intentions.

Moreover, it found that emotions, aesthetic experiences, and surroundings greatly influenced visitors' willingness to share positive feelings about their museum experience (Burkov & Gorgadze, 2023). One study analysed Turkish public sentiment related to Islam and national identity through text mining, demonstrating the method's applicability in cultural and political domains (Demirel et al., 2024). While text mining analysis has been used in museums, the Latent Dirichlet Allocation (LDA) model, a probabilistic technique for discovering hidden themes in large text datasets, remains underutilised in analysing museum visitor experiences. LDA is a topic modelling technique embedded within the broader text mining framework to identify hidden themes in extensive text collections.

3.0 Methodology

3.1 Research Approach

The data source is the content of online visitors' comments on the Ctrip.com platform of the Palace Museum of China and the China Science Museum. The research comprehensively applies keyword extraction, semantic network, LDA topic model, and other methods to mine user comments and comparatively analyse tourists' perceptions. The analysis framework is shown in Figure 1.

Keyword extraction was used to identify the core themes frequently mentioned by visitors in the reviews and to compare the main similarities and differences between cultural and technological museums. This helped the researcher initially classify the dimensions of the visitor experience. Semantic network analysis was then used to construct semantic structures and conceptual association networks in the text data of the two museums. The core-edge co-occurrence relationship of the hierarchical structure in the text collection is analysed. Further, LDA generates the distribution of topics, and the distribution matrix of 'document a topic' and 'topic a word' is obtained.

We systematically understand the theme models of the Palace Museum and the China Science Museum and deeply analyse the differences between the two in terms of the multidimensional perceptions of the visitor experience.

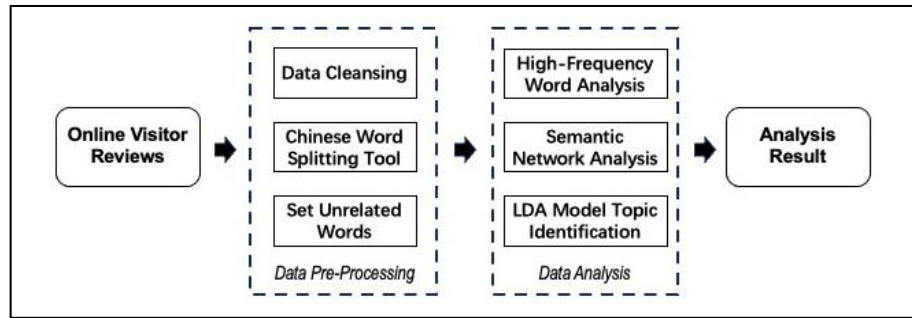


Fig. 1: Review analysis framework of online reviews of two museums
(Source: By author, 2025)

3.2 Data Collection and Pre-Processing

The study uses the collector to collect data on 6,187 reviews of the Palace Museum and 2,571 review information of the China Science Museum on platforms such as Ctrip.com. The review information of these two museums from 2022-2025 was collected, including fields such as user ID, review content, review time, and user rating. The collection followed the relevant data ethics codes and platform policies to ensure data compliance and ethical research.

Table 1. Number of reviews collected by the Palace and Science Museum

Sample of Chinese museums	Number of comments collected	Number of valid comments
Palace Museum	6187	5743
China Science Museum	2571	2500

(Source: By author, 2025)

To safeguard data quality, this paper pre-processes the collected data: first, duplicate comments, noisy data, invalid symbols, emoticons, and texts are removed. To ensure that the data were mainly derived from real tourists' self-assessments. Secondly, the web-based Chinese word-splitting tool was used, and deactivated words were set to remove deactivated words and word-splitting for the research data. Finally, 8243 valid comments were obtained, as shown in Table 1. After data cleaning, high-quality and structured data on tourists' comments was finally obtained. These data can effectively reflect the different environmental experiences of tourists in cultural museums and science and technology museums.

4.0 Findings

4.1 Explored Themes in Visitor Reviews

From the high-frequency word distribution, the Palace Museum reflects a tour-based experience. The red keywords like "tour guide" (3rd), "visit" (22nd), and "vivid" (21st) suggest that visitors value guided storytelling and an immersive historical atmosphere. In contrast, visitors to the China Science Museum focus more on "experience", "interaction", and "tour guide" (12th), showing a stronger preference for hands-on engagement. Lower rankings of "visit" (28th) and "vivid" (35th) indicate less emphasis on passive viewing and more on participation and discovery.

Second, differences in content focus between historical culture and scientific knowledge are evident. In the reviews of the Palace Museum, the high frequency of green words such as 'history', 'culture', 'imperial city', 'forbidden city', and so on shows that tourists are mainly concerned about its historical background, architectural features, and royal culture. The high frequency of 'story' indicates that visitors expect to gain historical and cultural knowledge. The reviews of the China Science Museum focused more on science education, and the occurrence of green words such as 'technology', 'science', and 'knowledge' indicated that visitors were mainly concerned about the popularisation of science and the educational value of the exhibition. Words such as 'learn' and 'study' suggest that parents have high expectations of the educational function of science and technology museums.

Thirdly, the demand for interpretation is high, with storytelling and guided tours each having their style. Both museums showed high demand in terms of interpretation, suggesting that both knowledge and expertise require the assistance of an interpreter to enhance the visitor experience. Reviews of the Palace Museum focus on words like 'tour guide', 'story', and 'detailed', suggesting that vivid storytelling can satisfy tourists' needs for explanations. The high frequency of blue words such as 'humour', 'Enriching' and 'Interesting' shows that humorous and contextual explanations can enhance visitors' experience. In addition, the blue words 'patience', 'meticulous', and 'serious' in the comments of the China Science Museum's explanation show that tourists have a high demand for the patience and guidance of the docents. The reason the China Science Museum is more inclined to explain widespread scientific knowledge and provide guidance for experimental operations.

Fourth, overall visitor feedback has been positive, although the emphases differ. High-frequency orange words such as "very good" and "Worthwhile" appear in reviews for both the Palace Museum and the Science Museum, indicating general satisfaction with the overall experience.

Table 2. Overall cognitive high-frequency words for the Palace Museum (PM) and the China Science Museum (CSM)

No.	PM	Frequ ency	CSM	Frequ ency	No.	PM	Frequ ency	CSM	Frequ ency
1	Palace Museum	4316	Children	1187	21	Vivid	469	Learning	105
2	Explanation	4291	Explanation	1007	22	Visit	441	Service	101
3	Tour Guide	1987	Teacher	941	23	Hours	432	Meticulous	99
4	Story	1790	Science Museum	360	24	Experience	432	Activity	90
5	History	1555	Experience	323	25	Reasonable	416	Serious	85
6	Teacher	1173	Knowledge	310	26	Service	413	Interaction	82
7	Children	1094	Very Good	246	27	Humor	410	Detailed	82
8	Imperial City	993	Nice	241	28	Entire Visit	392	Visit	81
9	Understanding	932	Like	217	29	Enriching	380	Gains	80
10	Knowledge	859	Worthwhile	201	30	Happy	375	Recommending	76
11	Very Good	842	Kids	195	31	Culture	371	Entertaining	76
12	Recommended	743	Tour Guide	150	32	Forbidden City	359	Feeling	74
13	Professional	724	Patience	147	33	Worthwhile	355	In advance	70
14	Detailed	662	Time	147	34	Arrangement	355	Beijing	70
15	In-depth	653	Technology	137	35	Enthusiastic	354	Vivid	68
16	Meticulous	649	Place	117	36	Witty	353	Adults	66
17	Touring	539	Suitable	114	37	Children	350	Suggestion	66
18	Beijing	536	Happy	109	38	Gratitude	350	Very large	64
19	Architecture	530	Content	105	39	Interesting	347	Rich	63
20	Special	490	Professional	105	40	Satisfaction	333	Interesting	62

(Source: By author, 2025)

4.2 Analysing the "Core-Edge" Relationship Network

Semantic network analysis can judge the co-occurrence of words, and the denser the connecting lines, the higher the degree of correlation between words. As shown in Figure 2, from the point of view of hierarchical structure, the semantic network graph presents the characteristics of a 'core edge'. The user comments on the two museums form a concentric circle structure centred on the core semantics of the museums.

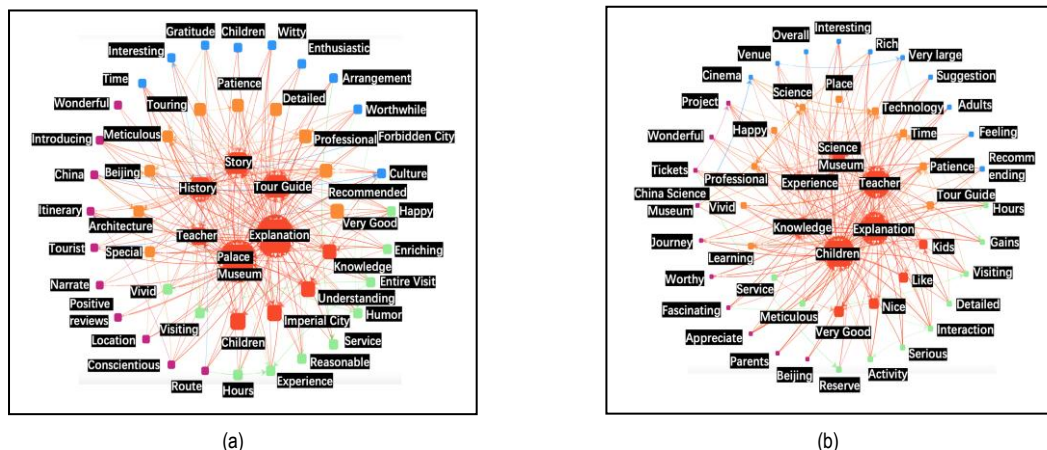


Fig. 2. (a) Semantic Networks in the Palace Museum; (b) Semantic Networks in the China Science Museum.

(Source: By author, 2025)

From the perspective of the core layer, the key terms for the Palace Museum include “Palace Museum,” “explanation,” “tour guide,” “story,” “history,” and “teacher,” indicating that visitor attention is primarily focused on its historical and cultural background as well as its interpretative services. In contrast, the core layer of the China Science Museum is organised around the keywords “children,” “explanation,” “teacher,” “science museum,” “experience,” and “knowledge,” reflecting its educational and interactive characteristics. Unlike the Palace Museum’s emphasis on historical and cultural attributes, the Science Museum’s key terms are more oriented toward popular science education. The prominence of “children” as a core term indicates that its primary audience consists of children and families.

From the transitional layer, keywords for the Palace Museum, such as “imperial city,” “architecture,” and “vivid,” serve to reinforce its cultural and architectural characteristics. Adjectives like “professional,” “detailed,” “patience,” and “meticulous” indicate that high-quality interpretative services are highly valued by visitors, suggesting that the museum experience relies on superior explanatory quality. In contrast, within the transitional layer of the China Science Museum, sensory terms such as “learning,” “science,” and “technology” underscore the museum’s educational function. The inclusion of terms like “patient,” “service,” and “meticulous” further suggests that

explanation quality remains an essential evaluative criterion. However, it appears that the explanatory approach in the Science Museum is more heuristic and interactive rather than merely focused on transmitting information.

From the peripheral layer, the diversity of keywords associated with the Palace Museum indicates that visitor evaluations encompass multiple dimensions, including cultural experience, itinerary planning, and interpretative style. Keywords like “reasonable,” “itinerary,” and “route” indicate that visitors are concerned with the design of the tour path, suggesting that the lengthy visiting routes at the Palace Museum and the effective scheduling of visit time are crucial factors influencing the overall visitor experience. In contrast, the peripheral layer keywords for the China Science Museum, such as “interaction,” “activity,” “project,” and “cinema”, suggest that the museum’s exhibitions predominantly feature participatory and immersive experiences. At the same time, terms like “tickets,” “parent,” and “journey” reflect its popularity as a destination for family outings.

4.3 Determining the Number of Topics

The model's perplexity degree trend is used to determine the number of topics and the clustering effect. The study chooses the number of issues when the decline of perplexity slows down to avoid overfitting while retaining the primary semantic information (Figure 3). On the other hand, the study examined the topic coherence metric. Suppose the high-frequency words within a topic are highly semantically related and frequently co-occur in the text. In that case, the coherence value is higher, implying that the topic is more interpretable (Figure 4).

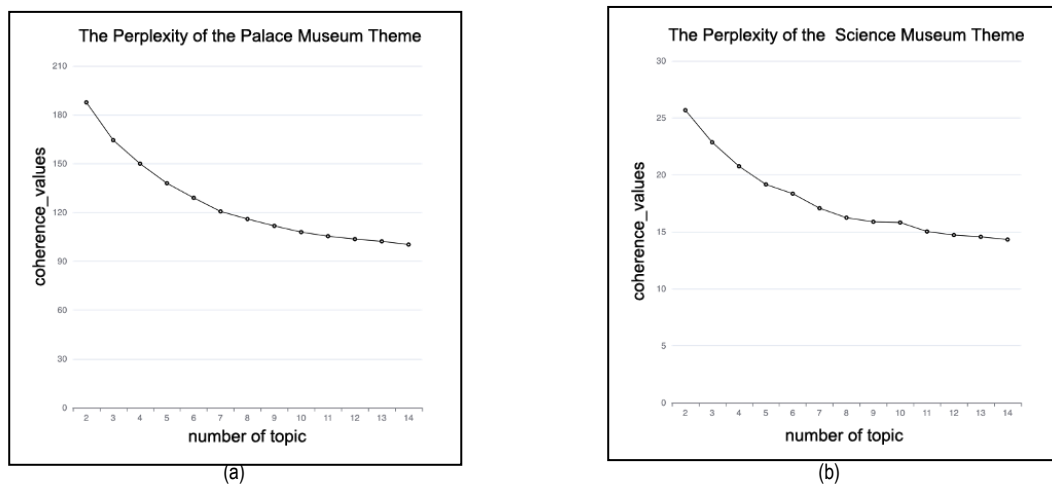


Fig. 3. (a) The Perplexity of the Palace Museum Theme; (b) The Perplexity of the Science Museum Theme.
(Source: By author, 2025)

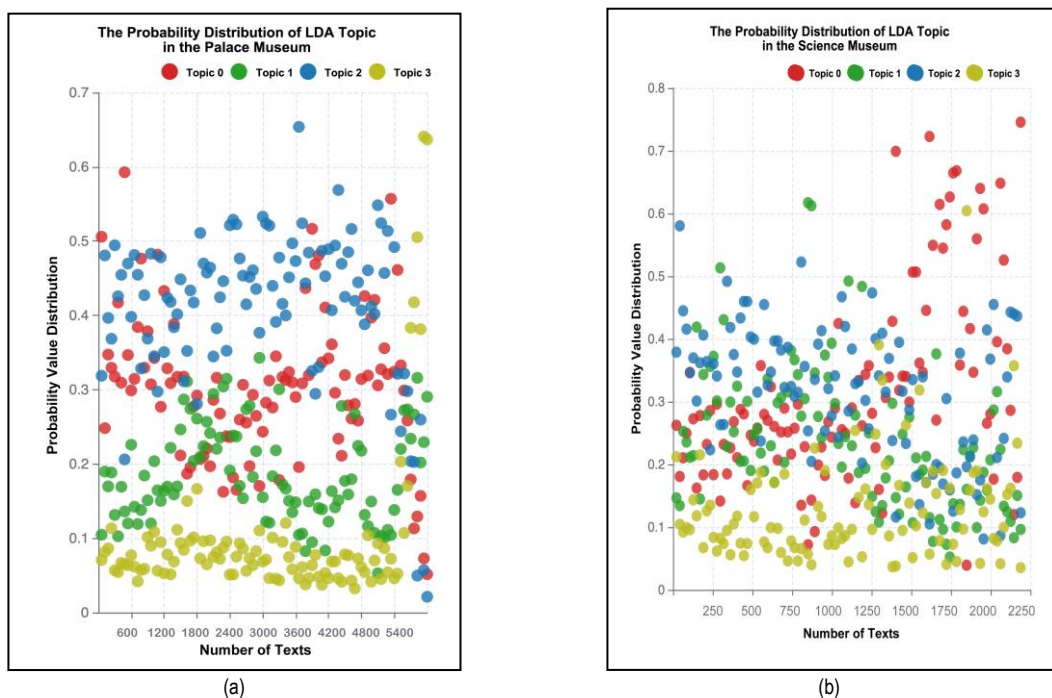


Fig. 4. (a) The Probability of LDA Topic in the Palace Museum ; (b) The Probability of LDA Topic in the Science Museum.
(Source: By author, 2025)

After training the LDA topic model, the generated 'topic-word' and 'document-topic' probability distributions are extracted. As in Table. 3, each topic's top 10 high-probability feature words are collated according to the high-probability feature words under each topic to determine the topic content.

The theme of Topic 0 is 'Pre-expectation and Ticketing', which includes information acquisition, ticket reservation, queuing for admission, ticket price, etc. This is conducive to analysing the gap between visitors' expectations and the reality before visiting the museum, optimising the ticketing process, and improving the ease of access to information to reduce the negative experience caused by the inconvenience in the early stage. Both museums emphasise 'booking' and 'tickets', indicating that visitors are concerned about ticket acquisition, the booking system, and admission arrangements before visiting.

Table 3. Distribution of experiences text 'Theme -Term'

Topic	Category	Top 10 high frequency words for Palace Museum	Top 10 words for China Science Museum
Topic 0	Anticipation & Ticketing	Touring, Visiting, Hours, Reasonable, Itinerary, Arrangement, Route, In Advance, Tickets, Reservation.	Time, Suitable, Visiting, Worth Recommending, In Advance, Suggestion, Tickets, Entire Journey, Check-In, Reservation.
Topic 1	On-site Explanation & Service	Explanation, tour guide, teacher, professional, detailed, patient, meticulous, vivid, humorous, enthusiastic.	Explanation, teacher, tour guide, patient, professional, meticulous, conscientious, detailed, vivid, brilliant.
Topic 2	Exhibition Content & Experience	Story, history, understanding, knowledge, richness, culture, worthwhile, satisfaction, gains, royal.	Knowledge, worthwhile, science, content, learning, activities, interaction, gains, fun and interesting, richness.
Topic 3	Facilities & Environment	Imperial city, architecture, Forbidden City, palace, crowded, attractions, weather, red walls, treasures gallery, yellow tiles.	Science museum, Beijing, very large, facility, cinema, objects, exhibition hall, exhibits, amusement park.

(Source: By author, 2025)

The Topic 1 theme identifies the 'On-site Interpretation and Services' category, which mainly covers manual interpretation, electronic guides, exhibition guides, and counselling and answering services. The purpose of this dimension is to measure the effectiveness of the museums' knowledge transfer and visitor services, as well as to optimise how the interpretation is delivered and improve the services' responsiveness. Visitors to both museums paid great attention to the quality of interpretation. They emphasised the interpreters' professionalism, patience, meticulousness, and vividness, suggesting that high-quality interpretation significantly impacts the visiting experience.

Topic 2's theme identity category is "Exhibition Content and Experience", which is the core competence of museums and involves the quality of exhibits, thematic planning, exhibition design, and interactive experience. This dimension assesses whether the exhibition meets the interest and cognitive level of different groups and reflects the museum's brand through the exhibition content. The difference between the two in terms of exhibition content determines the story-led guided tour service participatory experience approach of the Palace Museum. The China Science Museum has an interactive and participatory experience, mainly edutainment.

The Topic 3 theme identifies the 'Venue Facilities and Environment' category, including spatial layout, architectural features, resting areas, pavilion facilities, etc. This dimension analyses the impact of the physical environment on the visitor experience and improves the venue's design to harmonise visitor flow, environmental comfort, and functional convenience.

5.0 Discussion

5.1 Practical aspects

In terms of practice, both museums show the importance of interpretative services, but with different emphases. The Forbidden City's interpretation is to deepen the understanding of cultural heritage by telling historical stories through vivid explanations. The Museum of Science and Technology, with its predominance of younger visitors, is more likely to expect precise and easy-to-understand information when visitors experience scientific knowledge. The study found that visitors to the Palace Museum focus on the historical atmosphere, crowd density, and guided tours. In contrast, visitors to the China Science Museum emphasise interactive exhibits, family friendliness, and educational value.

5.2 Theoretical aspects

According to J. Falk & Storksdieck (2005) 'Contextual Model of Learning', the museum experiences are shaped by the dynamic interaction of three overlapping contexts: personal, sociocultural, and physical. In this study, the LDA model was used to model the themes of visitors' comments on the Palace Museum and the China Science Museum, and the keywords that are closely related to the visiting experience were extracted from the big data, which were summarised into the four dimensions of pre-expectation and ticketing, on-site explanation and service, exhibition content and experience, and venue facilities and environment. This multi-dimensional experience analysis is highly compatible with Falk and Storksdieck's theory. The evaluation framework constructed in this study is precisely a concretisation of this continuous process, quantifying and comparing the roles of pre-information acquisition, on-site interpretation, exhibition interaction, and physical environment, respectively, to comprehensively capture the multilevel characteristics of the visitor experience.

6.0 Conclusion& Recommendations

To enhance anticipation management, museums can display the remaining tickets, peak traffic hours, and a clear map of the distribution of exhibition halls in real time on the official website or app. To meet the diversified needs of visitors, it is recommended that various ticketing options, such as 'family packages' and 'time slot reservation', be introduced to divert crowds and reduce queuing pressure effectively. On-site explanation services should consider different ages and knowledge backgrounds and meet the dual needs of cultural cultivation and science education through contextualised stories or interactive experiments. With the help of apps, AR devices, or multilingual voice guides, intelligent explanations can be realised to meet visitors' needs for personalised, in-depth exploration. Environmental maintenance and crowd control should be coordinated to ensure that the temperature, light, and air circulation are within the ideal range and that crowding is reduced through diversionary instructions.

Future research could explore how digital tools such as AR and real-time data systems influence visitor satisfaction and behavioural engagement in different types of museums. It may also be valuable to examine how personalised interpretation strategies can be adapted across diverse demographic groups.

Ultimately, a balance is struck between authenticity and interactivity for visitors so that they can deeply experience cultural heritage while enjoying the novelty and fun of modern technology.

Acknowledgements

While completing this paper, the author would like to thank the collaborators for their valuable academic advice, which significantly supported this research. The author would also like to acknowledge the administrative support from Universiti Teknologi MARA.

Paper Contribution to Related Field of Study

This paper contributes to museum studies by revealing distinct visitor demands in historical-cultural and technology-focused contexts. It offers an evidence-based framework for enhancing exhibition design and service strategies.

References

- Annechini, C., Menardo, E., Hall, R., & Pasini, M. (2020). Aesthetic Attributes of Museum Environmental Experience: A Pilot Study With Children as Visitors. *Frontiers in Psychology*, 11. <https://doi.org/10.3389/fpsyg.2020.508300>
- Burkov, I., & Gorgadze, A. (2023). From text to insights: Understanding museum consumer behavior through text mining TripAdvisor reviews. *International Journal of Tourism Cities*, 9(3), 712–728. <https://doi.org/10.1108/IJTC-05-2023-0085>
- Demirel, S., Kahraman, E., & Gündüz, U. (2024). A text mining analysis of the change in status of the Hagia Sophia on Twitter: The political discourse and its reflections on the public opinion. *Atlantic Journal of Communication*, 32(1), 63–90. <https://doi.org/10.1080/15456870.2022.2093354>
- Falk, J. H. (2016). *Identity and the Museum Visitor Experience*. Routledge. <https://doi.org/10.4324/9781315427058>
- Falk, J., & Storksdieck, M. (2005). Using the contextual model of learning to understand visitor learning from a science center exhibition. *Science Education*, 89(5), 744–778. <https://doi.org/10.1002/sce.20078>
- Goulding, C. (2000). The museum environment and the visitor experience. *European Journal of Marketing*, 34(3/4), 261–278. <https://doi.org/10.1108/03090560010311849>
- Mao, Y., Qiu, P., & Fei, T. (2023). Research on the Standardization of Public Cultural Institutions—Libraries, cultural centers, museums and science and technology centers as examples. *China Standardization*. <https://doi.org/10.3969/j.issn.1002-5944.2023.11.006>
- Nigatu, T. F., Trupp, A., & Teh, P. Y. (2024). A Bibliometric Analysis of Museum Visitors' Experiences Research. *Heritage*, 7(10), Article 10. <https://doi.org/10.3390/heritage7100260>
- Recupero, A., Talamo, A., Triberti, S., & Modesti, C. (2019). Bridging museum mission to visitors' experience: Activity, meanings, interactions, technology. *Frontiers in Psychology*, 10, 2092.
- Ruiz-Alba, J. L., Nazarian, A., Rodríguez-Molina, M. A., & Andreu, L. (2019). Museum visitors' heterogeneity and experience processing. *International Journal of Hospitality Management*, 78, 131–141.
- Sheng, C.-W., & Chen, M.-C. (2012). A study of experience expectations of museum visitors. *Tourism Management*, 33(1), 53–60. <https://doi.org/10.1016/j.tourman.2011.01.023>
- Yi, K. (2024). Review of Museum Experience Design Research Based on Bibliometrics. *PACKAGING ENGINEERING*. <https://doi.org/10.19554/j.cnki.1001-3563.2024.20.025>