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Museums in China: The Spatial Layout of Exhibition Halls and its Impact on Visitor Experience

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Abstract

This research question focuses on identifying how museum Exhibition Halls in China are laid out in terms of floor plans. The floor plan of a museum plays a crucial role in shaping the visitor experience and the overall effect of the exhibition, and a scientific spatial layout not only serves to create a good visiting environment but also helps visitors better understand the context of the exhibition and creates a space for experiencing it. This study conducted in-depth research on three museums in China, collected relevant data through observation and interview strategies, coded all the data in a unified way, and analysed the commonalities and found the differences in the floor plan layouts of each museum. This study aims to illustrate the specific impacts of museum floor plan layout on visitors' experience, providing some reference value for the design of museums in China.

Keywords: *Museums in China, Floor Plans, The Impact on Visitors' Experience; Spatial Layout, Timeline Series, Narrative Structure Sequence.*

Introduction

Research Significance

By the end of 2023, the total number of museums in China reached 6,833. At the end of 2024, statistics are expected to exceed 7,000, surpassing Germany in total number and ranking second in the world after the United States (Feng & Zheng,2025). Museums are public institutions with educational functions, significantly disseminating cultural knowledge, promoting rational enlightenment, and innovating educational methods (Duan,2021). The floor plan layout of museum exhibition halls is essential for visitors, and a scientific layout means creating an atmosphere that makes visitors feel comfortable, excited, and curious. The spatial flow of the museum is not only the behavioural path of the visitors but also the link that effectively spreads the various display items in the museum to the audience, which is the essence of the spatial organization of the museum (Yang & Ma, 2019).

The visiting time, the visiting form, and the degree of attention to the exhibits are all generated under the guidance of the visitors' psychological and cognitive style and the active design of the designers. The museum spatial flow line is not only the behavioural path of visitors but also the link that effectively spreads various display items in the museum to the audience, which is the essence of museum spatial organisation (Yang & Ma, 2019). Whether the flow of the visit is

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smooth or not directly affects the behaviour of the visitors (Tian, 2015). A reasonable layout of the exhibition hall can realise the organic series and flow of the exhibition content so that the audience can systematically understand the vein and theme of the exhibition (Zhang & Qin, 2024). This paper aims to discover the influence of the exhibition hall's planned layout on the visitors' actual visiting experience, to propose a better reference for the planned layout design of the museum.

Research Methodology

The research methodology used in this study is mainly grounded theory and case study methods. Grounded theory is a bottom-up approach to building theories by taking a research phenomenon or problem, generalising concepts and categories from primary sources, and then moving up to theories, a method and research strategy that allows theories to emerge from the data collected (Shahid Khan, 2014). Case study research is a widely used method of data collection where the research is centred around specific propositions, problems, or activities. It also has the flexibility to modify these research questions as the analysis progresses. (Yin, 2013). Case studies are in-depth, detailed, and specific, allowing for close attention and an in-depth examination of the case. At the same time, case studies are highly feasible and very pragmatic (Malcolm Tight, 2019). These desirable features are the main reasons why researchers choose this research strategy. Grounded theory and case study address the research question, can collect complementary data, and can be analysed correspondingly. The two are suitable for use in combination to facilitate an in-depth study of the research question (Yin, 2014).

In the data collection process of this study, interviews and observations were used to collect information about the layout of exhibition halls in Chinese museums, and the theory was summarised through data analysis. This study belongs to the descriptive research in the multi-case study, and the case museums are (i) Hebei Museum in Shijiazhuang City, Hebei Province, North China, (ii) Beijing Printing Museum in the Chinese capital, and (iii) Police Museum in Wuhan City, Hubei Province, Central China. Each of these three museums has its characteristics, which are representative and of research value (Figure 1). The museums selected for the case study cover three different types and levels of museums. At the same time, they are in different provinces, which means they can avoid simply selecting newly built or technologically advanced museums. This diversified selection ensures the study can cover rich exhibition contents and diverse audience groups. It also helps to reflect the different practices and innovative strategies adopted by the museums in terms of exhibition space, technological applications, and audience interaction. The study collects information about the floor plan layout of exhibition halls through detailed and multiple research projects on the above three Chinese museums. It integrates and uses the collected information as supporting materials to conclude the research objectives. This case study uses rooted theory to allow for a more comprehensive collection of information.

No	Museum Name	Nature	Position	Building Year	Building image
1	Hebei Museum	Comprehensive museum	Shijiazhuang City, Hebei Province	Old Museum: 1953 New Museum: 20	

				14	
2	Police Museum in Wuhan	Thematic museum	Wuhan City, Hubei Province	2019	
3	Printing Museum in Beijing	Thematic museum	BeiJing	Opened in 1996. Renovated in 2001.	

Figure 1: Selected Objects for the Case Study

Source: Author (2024)

Data Collection

This study adopts non-participatory observation, which puts oneself outside the observed world and acts as a bystander to understand the dynamics of what is happening. During the observation process, different types of visitors were first selected. Then, their visit routes were followed throughout the whole process, recording the visitors' behaviours at key locations such as the museum hall, artefacts exhibition halls, rest areas and souvenir shops, and recording their visit routes and the time they spent at the key locations, as well as recording their exhibition viewing behaviours. The environment should be familiarised with before the observation, and during the observation, the content was recorded by taking photos with mobile phones and writing observation notes with pens. The notes were sorted out at the end of the observation. The observation process is referred to in Juanita et al. (2009), who proposed the three steps of observation.

At the observation's end, some audience members were selected to look for semi-structured interviews based on the pre-written interview questions. The interviewees were identified as visitors, designers, and museum staff of the three museums selected for the case study. The interviewees were identified and allowed to withdraw from the interview at any time during the interview process. Audio or video recordings were recorded with their consent to facilitate later data analysis. The interviews were audio-recorded and supplemented with notes. After the interviews were completed, the audio recordings were converted using professional speech-to-text software, and the transcribed text became one of the primary sources for data collection. After completing all the processes, the recordings were collated into text files. The contents were carefully proofread to ensure the recorded information accurately reflected the interviewees' views and insights. This series of operations improved the interview data and laid a solid foundation for subsequent analyses and discussions. In the end, the researcher obtained 17 interview transcripts of museum staff (Figure 2), and a total of 60,000 words were obtained after converting the audio recordings into text.

Group	Interviewee	Quantity
Group1 Museum Designer	Designers involved in the design of 3 case museums	3
Group2 Visitor	Visitors who have just finished visiting the 3 case museums	11
Group3 Staff	Official management staff of 3 museums	3

Figure 2: Person Interviewed

The data analysis process begins with open coding to categorize and analyse the collected data. In open coding, the researcher reads the data carefully, identifying and recording the various concepts, themes, and patterns that emerge from the data. The process of further categorising the statements in the primary data is done through constant comparison, refinement, and generalisation. Open coding allows the researcher to gain insight into the data and provides a basis for subsequent coding and analysis.

The researcher meticulously analysed and conceptualised the initial data, and forming these initial categories not only helped clarify the core content of the research data but also laid a solid foundation for subsequent coding. Through these initial generalisations, we could understand more clearly the patterns revealed by the data, providing a direction for exploring the planar layout of the space (Figure 3).

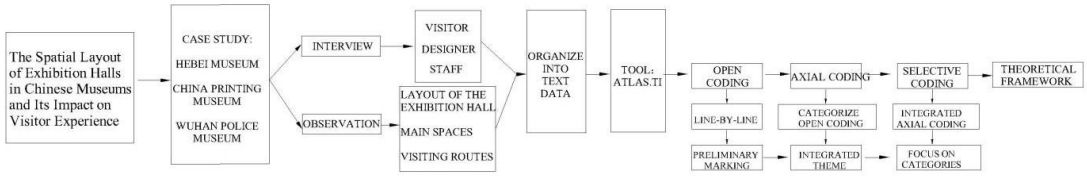


Figure 3: Research Steps

After systematic coding of the interviews and observational data, 27 initial codes were distilled by removing some of the duplicated codes that were not relevant to the research questions (Figure 4).

N0.1	OPEN CODING (ELEMENTS)	**DIMENSIONS**	THEMES	DOMAINS
1	From ancient times to the present	Historical Development of Hebei	Timeline Series	
2	Historical dynasties			
3	Over time			
4	History of Printing in China	Printing History		

5	Development of the history of printing in the world			Spatial Layout
6	From the oldest time			
7	Deep emotional resonance	History of the development of the police system in Wuhan		
8	From the Qing Dynasty to Reform and Opening Up			
9	Wuhan Public Security Anti-epidemic Theme Exhibition	Thematic Exhibitions	Narrative Structure Sequence	
10	Stone Carving Art Theme Exhibition			
11	Famous Porcelain and Kiln Exhibition			
12	Mural Art Themes			
13	Printing equipment exhibition hall			
14	inflexibility	Tandem Layout	Exhibition Hall Layout Structure	
15	Clear exhibition hall entrances are important			
16	Guided route			
17	Visitor flow is clear			
18	Fixed route			
19	Shorten the flow of visits and save time	Radial layout		
20	For targeted visits			
21	Return to the centre of convenience			
22	Flexible tour routes			
23	Difficulty in understanding the subject matter			
24	Facilitates the integration of information	Radial-tandem layout		
25	Shorten the flow of visits and save time.			
26	Lack of orientation of the route			
27	Complex routes lead to confusion.			

Figure 4: Codebook

In spindle coding, the researcher grouped and categorised the concepts and themes identified in the open coding, identifying associations and connections between them (Figure 5). Through spindle coding, the researcher gained an in-depth understanding of the data's structure and internal logic and identified general patterns and motifs. Selective coding was made based on spindle coding, a step of refinement and generalisation, identifying the core themes and patterns in the data.

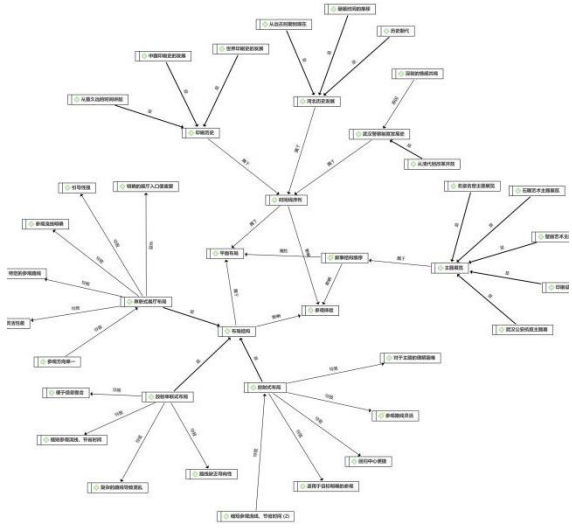


Figure 5：The Search for Theme

Through repeated and detailed on-site observations, the authors have compiled the following table of the layout of the three museums, which presents the primary information on the location and size of each exhibition hall (Figure 6). At the same time, the authors also drew a flow chart based on the reference routes suggested by the museums (Figure 7).

Museum Name	Type of space	Exhibition Hall Name		Exhibition Area	Location
Hebei Museum	Exhibition space	The Stone Age of Hebei	H1	873	Northeast Exhibition Hall, South District, Third Floor
		The Civilisation of the Shang Dynasty in Hebei	H2	972	Southeast Exhibition Hall, South District, Third Floor
		The Story of State Yan	H3	1845	West Exhibition Hall, South District, Third Floor
		The Story of State Zhao	H4	1845	West Exhibition Hall, South District, Second Floor

		Treasures of the Han Dynasty - The Han Tombs in Yancheng County	H5	1845	East Exhibition Hall, South District, Second Floor
		Quyang Stone Carvings	H6	729	Northeast Exhibition Hall, South District, First Floor
		The Fresco of The Northern Dynasties	H7	850	Southwest Exhibition Hall, South District, First Floor
		Selected Porcelains Made in Well-Known Kilns	H8	873	Northwest Exhibition Hall, South District, First Floor
		The Anti-Japanese Flames of War	H9	1300	Southeast Exhibition Hall, North District, Second Floor
		"Enjoying Hebei" Intangible Cultural Heritage Reception Room	H10	1300	Southwest Exhibition Hall, North District, First Floor
		Temporary Exhibition and Preparation Hall		85596	Mainly distributed across the First and Second Floors
	Service Space	North District Entrance Hall		350	North District, First Floor
		South District Entrance Hall		1306	South District, First Floor
	Other Main Public Spaces	Atrium (Sunlight Hall)		793	North-South District, Second Floor
		Rest Area/Catering Space		2046	South District, Basement Level, South District, First Floor
		Souvenir Shop		1727	South District, First Floor
		Multi-Functional Exhibition Area	W1	138	West Side Exhibition Hall, First Floor
		Special Exhibition Area	W2	50.3	Southeast Corner Exhibition Hall, First Floor

Wuhan Police Museum	Exhibition space	Focus on the Glory of Wuhan Police	W3	25.2	West Side Exhibition Hall, Second Floor
		The Late Qing Dynasty: Initiation of Police Administration	W4	36.6	Southwest Corner Exhibition Hall, Second Floor
		The Republic of China era: Consolidation and Extension	W5	62.8	Northwest Side Exhibition Hall, Second Floor
		The Republic of China era: Consolidation and	W6	30.7	Northeast Corner Exhibition Hall, Second Floor
		Reform and Opening-up: The Road to Innovation	W7	44.2	Southeast Corner Exhibition Hall, Second Floor
		Display Platform in the Air	W8	106	Roof (East Side), Second Floor
	Other Spaces	Cultural Exchange Zone (not open)		305	Third Floor
China Printing Museum	Exhibition Space	Printing in the East	Z1	800	First Floor
		Printing in the World—The Development of Modern Printing、Printing in the World—The Development of Modern Chinese Printing、Printing in the World—Printing in Nowadays	Z2、Z3、Z4、Z5	800	Second Floor
		Chinese and foreign printing equipment	Z6	2200	First Basement Level

	Other Main Public Spaces	Service Desk		90	First Floor
		Entrance Hall		350	First Floor
		Rest Area		80	First Floor
		Printmaking Experience Zone		150	First Floor

Figure 6: Key Information on Each Exhibition Hall of the Three Museums

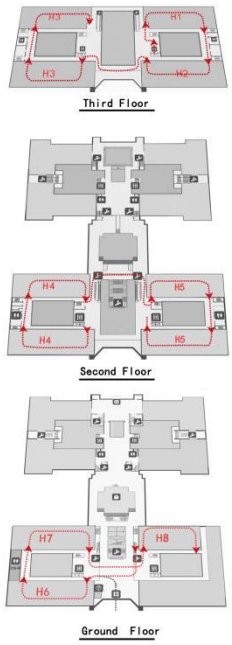
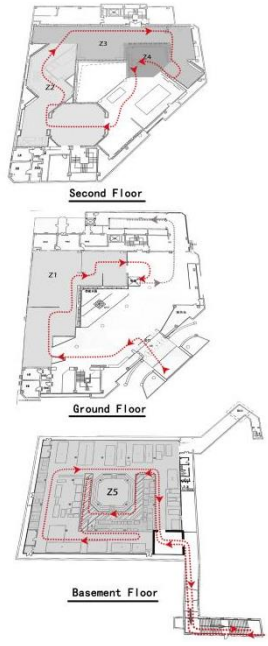
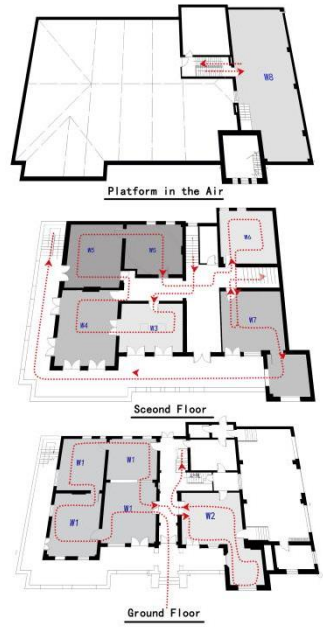
Hebei Museum	China Printing Museum	Wuhan Police Museum
		

Figure 7: Routes to the Three Museums

Data Analysis

The floor plan of a museum refers to the planning and design of its internal space, aiming to provide the best support for the exhibition content. When designing the museum pavilion display space, in addition to the need to consider the matching of display equipment and cultural relics exhibits, it is also necessary to take into account the scientific and rational nature of the entire pavilion display space as well as the multiplicity and orientation issues brought about by the sequence of the research space (Ren,2022). After a detailed analysis of the case, it was found that museums usually have fixed and temporary exhibition halls, and some venues also have

thematic exhibitions. Given the varying needs of different exhibition halls, it is difficult for a single narrative to meet the requirements of all exhibition halls. This study found that museums in China would adopt two main types of layout: a timeline sequential structure and a narrative structure, the choice of which depends on the richness of the museum's exhibition content. In addition, the variability in the layout of exhibition halls is reflected in the different ways the halls are strung together, and the different ways in which the halls are strung together lead to differences in the visitors' experience of visiting the museums. In data analysis, the researcher will first explore the commonalities of museum layouts and then analyse their differences to comprehensively analyse the characteristics of the floor plan layouts of museum exhibition halls and the visiting experience they bring to visitors.

Timeline Sequence

The three museums in the case study all use the time-based layout of the exhibition halls, displaying the contents in an orderly manner based on the development of time, from ancient to modern times. Timeline sequence refers to arranging specific exhibition contents chronologically, showing historical events, development processes, or evolutionary relationships in time. The spatial layout based on the chronological development can more effectively guide the audience to form a systematic cognition of the exhibition content, providing a natural and easy-to-understand logical order so the audience can more easily grasp the content of the timeline.

Hebei Museum

The permanent exhibition halls of the Hebei Museum display important cultural relics from the Hebei region at five central historical nodes (Stone Age, Shang Dynasty, Western Zhou Dynasty, Warring States Period, and Han Dynasty) on the axis of a timeline. From the first gallery on the third floor, visitors go down floor by floor in chronological order and gradually learn about the Hebei region's historical and cultural development, regional characteristics, and religion and art. This tour path clearly shows the development of Hebei's history while providing visitors with an intuitive way of interpreting cultural relics according to chronological clues.

'Halls H1-H5 in the permanent exhibition halls of the Hebei Museum are arranged in clockwise order according to the timeline, displaying important cultural relics unearthed in Hebei Province during various important periods in history, and the permanent exhibition halls are dedicated to the story of Hebei from the Stone Age up to the modern era.' (Hebei Museum Observations)

The interview data collation revealed that staff, designers, and visitors expressed a high degree of recognition for this timeline-sequenced layout of the exhibition halls. They believe that this sequential layout not only conforms to the lineage of historical development but also provides visitors with a logical and clear visiting experience, helping them to understand the exhibition's content smoothly.

Generally, the timeline is that if it is to see the various museums and their heritage properties, it may be that the geographical nature is relatively strong. That is to see you like our museum, well, the two more famous halls, one is the Manchu Han Tomb, well, more a Warring States Zhongshan cultural relics, that these two are our main exhibition hall, is our entire exhibition hall, well, characteristics of the exhibition hall. Whether it is the whole exhibition hall or the interior of these two exhibition halls, it is all told in this order (Hebei Museum Designer Interview)

‘Chronologically, the starting gallery is on the third floor, called Hebei in the Stone Age. Then, it has told one hall at a time, one hall at a time, as time passes. The nearest fixed display in time is about the intangible cultural heritage of Hebei Province.’ (Hebei Museum staff interview) Staff interviews further illustrate that this hall layout is closely related to the attributes of the exhibition content; for example, characteristic halls such as the Manchurian Han Tomb and the Zhongshan Cultural Relics Hall of the Warring States all tell history through chronological order, highlighting Hebei’s locality and cultural characteristics. This layout continues historical clues and a powerful presentation of Hebei’s unique history and culture.

Visitors’ feedback confirms the importance of this timeline layout to the visiting experience. Many visitors mentioned that this timeline sequence from ancient times to modern times helped them better extract the core information of the display content while providing a clear reference basis for the visiting steps.

‘So, I think it is OK, but it is not the first time I have been here, so I know what is probably on display on each floor of this museum. So I visited chronologically, from ancient times until now.’ (Tourist 1 interview)

‘I feel that if he arranges it chronologically, from the third floor downwards after finishing, this is OK; I am more interested in the one on the first floor, the Manchu Han Tomb.’ (Visitor 4 interview)

II. China Printing Museum

The China Printing Museum is currently the world's most extensive professional printing museum (Huang,2022). On 21 December 2020, the China Museum Association officially listed the China Printing Museum as a national-level museum (China National Radio, 2020). It has three permanent exhibitions, namely ‘Printing in the East: The Roots of Printing in China’, ‘Printing in the World: Mutual Enlightenment of Printing and Civilisation’, and ‘The Treasure of Printing Machines: Chinese and Foreign Printing Machinery and Equipment’. ‘The ‘Treasure of Printing Machines - Exhibition of Chinese and Foreign Printing Machinery and Equipment’ has three permanent exhibitions showing the historical origin, development, and spread of printing. The exhibition hall takes the timeline as its main line, showing the origin and development of ancient Chinese printing from 4000 BC to the 6th century through the ground floor. In contrast, the first floor introduces the course of change in China’s printing industry and technology since the introduction of modern printing in the middle of the 19th century. This timeline presentation is clearly structured, thematically focused, and highly logical, helping the audience to fully understand the historical evolution of printing in China and the world. Interview data further revealed the design concept of this timeline layout. Both staff and designers mentioned that the core basis for the layout of the exhibition hall is the historical development lineage and that through the serial narrative approach, the contents of different periods are organically organised in a logical order, which provides visitors with a visiting experience that is clear and in line with cognitive habits.

China Printing Museum staff and designers mentioned in the interview that they were ‘over there basically according to that... It is in chronological order of development. The big board is the ground floor, which is the origin of printing in ancient China, from the production of words to speak to the production of papermaking, engraved books, and so on. The first floor is about modern technology and machines, the rise and development of the printing industry, and printing in contemporary life. It is mainly about the history of printing in chronological order.’ (Designer

of the China Printing Museum) 'So you say spatial sequence; in fact, our museum is simple to look at; there is only one pavilion on each floor, one with one big content. In terms of time, the ground floor of the timeline is the furthest from the origin of the Chinese printing industry and the origin of papermaking; the first floor is the world side of the history of printing. On the ground floor, there is a variety of equipment from abroad. It is an obvious lineage' (China Printing Museum staff interview)

Feedback from visitors likewise affirmed the rationality and logic of the layout. They said that the spatial layout of the pavilion is reasonable, the narrative vein is precise, and they can easily understand the exhibition's content by visiting the timeline. 'In terms of the narrative of the content, it is a spiral from the ground floor to the first floor according to the development of time, and in terms of the plane, it can converge to a circle.' (Visitor 1 interview) 'This overall space feeling or a more reasonable distribution of it. This spatial layout should be mainly based on the development of the entire history of this printing to be carried out, along the line, can look.' 'According to this historical order of layout, so this whole order, by the printing history of this chronological layout, is still relatively clear.' (Visitor 4 Interview)

III. Wuhan Police Museum

As a museum that records, protects, and displays the history of the development of the Wuhan Police in a thematic form, the Wuhan Police Museum attracts many visitors with its unique architectural style, clear spatial layout, and rich exhibition content. Located at No. 271 Shengli Street in Jiang'an District, the museum was originally the former site of the Inspector's Office of the Ministry of Industry of the German Concession at the end of the Qing Dynasty, and this 100-year-old building not only adds a sense of history to the museum but also becomes an important cultural symbol of it. With an exhibition area of 1,200 square metres, the museum contains a permanent exhibition hall, a temporary exhibition hall, an outdoor exhibition area, and a space for cultural exchanges, giving full play to the important roles of patriotism education, rule of law propaganda, and interaction between the police and the public.

The Wuhan Police Museum demonstrates the historical evolution of the Hubei Police and Wuhan Police from the late Qing Dynasty to modern times through the timeline sequence of the exhibition. The spatial layout of the exhibition is hierarchical, unfolding progressively from the ground floor to the first floor. On the ground floor, a temporary exhibition hall currently displays the 'Wuhan Public Security Epidemic Resistance Theme Exhibition'. On the first floor is the 'Basic Exhibition of Wuhan Police History', which displays the achievements of the Wuhan Public Security Bureau from the establishment of the police system in the Qing Dynasty to the development of the Wuhan Public Security Bureau after the reform and opening up, by dividing the exhibition into different sections. The important points of each period are reasonably divided into different exhibition halls, forming a clear layout of 'one section, one exhibition hall'. As the staff mentioned, 'the first floor is also according to the development of Hubei police, Wuhan police, the beginning of the Qing Dynasty, the establishment of the police system, until after the reform and opening up of the Wuhan Public Security Bureau made some achievements, a section of an exhibition hall. This kind is the clearest bar.' (Interview with Wuhan Police Museum staff)

Visitors mentioned in the interview, 'I remember there is an exhibition hall on the first floor, it has a big glass cabinet, and then inside this glass cabinet it has some scenes, that is, we are from the end of the last century to the beginning of the century, maybe the police is what kind of evolution of the process, it is with this kind of figure of coloured clay kind of mode, it seems to carry out this kind of display, and then I just in this piece I looked at it for a long time, um, and

then the ground floor when you enter the building, actually the facade I think this piece is still quite distinctive.' (Visitor 2 interview) The visitor's remarks reflect the logical design of this timeline sequence of exhibitions, which not only shows the historical lineage of the development of the police system but also helps the audience to understand the content more intuitively.

By examining three representative museums, the advantages of following a timeline sequence in the layout of the exhibition halls are apparent, as reflected in the interviews with museum staff, designers, and visitors. The chronological layout can not only logicise the content but also enhance the sense of hierarchy and attraction of the exhibition through progressive narrative techniques, perceive the cause and effect relationship of historical events as well as the development of culture, science and technology, etc., and help the audience to form a comprehensive understanding from the whole to the details, and from the past to the future in the course of the visit. In addition, this layout enhances the educational value and sense of participation in the exhibition, enabling the audience to experience the heaviness and continuity of history over time. Therefore, the exhibition design based on time sequence presents historical knowledge and profoundly influences the audience's cognitive process, providing a more logical and coherent expression for the museum's display. This approach is particularly suitable for presenting a specific theme or region's development history. Through the continuity of time clues, the audience can feel the key nodes in the historical process, the evolution of events, and changes in the relevant background.

5.2. Narrative structure sequence

Narrative structure enables the viewer to explore along clear narrative threads by organizing an exhibition around a specific theme or event. This structure usually comprehensively presents time, place, people, or events. It can effectively enhance the attractiveness and overall coherence of the exhibition.

I Museum 1: Hebei Museum

Hebei Museum is the largest comprehensive exhibition in Hebei Province, with a large exhibition area and many collections. It is impossible to exhibit the regional culture of Hebei Province comprehensively with only one narrative, so the three permanent exhibition halls on the ground floor adopt a thematic format, setting up thematic exhibitions for cultural relics with important themes, which avoids the appearance of a particular theme with huge pages in exhibition halls strung together according to a timeline, thus allowing the audience to be more focused and in-depth understanding of the exhibition content. This avoids the emergence of a particular theme in the exhibition halls linked by a timeline, thus allowing the audience to have a more focused and in-depth understanding of the exhibition content. This narrative structure, which unfolds around the theme while supplemented by the logic of the timeline, clearly shows the historical development and guides the audience to an in-depth understanding of the theme, enabling the audience to focus more on the cultural relics of a specific topic and to deeply understand the regional culture of Hebei while avoiding the imbalance of space that the exhibition may cause according to the timeline.

'The exhibition hall on the ground floor, for example, the exhibition hall of porcelain, porcelain is not suddenly produced, so this exhibition hall has a theme, talking about the famous porcelain and kilns of various historical dynasties around this theme, but in fact, it is also told according to the timeline.' (Hebei Province staff interview) I look at the exhibition hall, which is to turn around and look at the ground floor of this exhibition hall one by one. Each exhibition hall has

a theme, like telling a story, reading this story and then looking at the other story, which interested me to look at more. (Visitor 1 interview)'

'If visitors start their visit from the ground floor after entering the south lobby, there will be no confusion because the three exhibition halls on the ground floor belong to thematic exhibitions, and each exhibition hall is centred around a theme. For example, the Famous Porcelain and Kilns exhibition hall displays porcelain unearthed in Hebei during the North and South Dynasties, the Tang and Song dynasties, and the Yuan, Ming and Qing dynasties, highlighting Hebei's status as a major ceramic province.' (Observation Notes, Hebei Museum) 'The main exhibition is the art of mural painting during the Northern Dynasties, with some of the finest originals presented in the pavilion and copies drawn from the originals to enable the audience to view them more clearly.' (Hebei Museum Observation Notes) 'The Quyang Stone Sculpture Exhibition Hall, with an area of 729 square meters, is located in the northeast exhibition hall on the ground floor of the South Zone, displaying 132 pieces of fine Quyang stone sculptures from the Han Dynasty to the Yuan Dynasty. The main exhibits are stone carvings of the Han Dynasty, mostly Buddhist statues, stone statues, and other works of art. Many stone carvings of Han alabaster are displayed in exhibition halls, and the display is mainly in kind.' (Hebei Museum Observation Notes).

II. China Printing Museum

The Chinese Printing Museum tells the history of printing and mechanical equipment development in China and the world thematically. The museum is divided into three exhibition halls, showing the history of printing and printing equipment. Among them, the 'Thematic Display of Printing Equipment' in the underground exhibition hall adopts a narrative structure centered on the development process of printing equipment, displaying various models of equipment from 1865 to the 1990s, covering the technology required for the entire printing process. Through the zoned thematic exhibitions, the China Printing Museum provides a detailed explanation of the technologies and equipment and offers the audience an intuitive experience of the history of printing.

The museum exhibits various pre-press, printing, and post-press processing equipment models from 1865 to the early 1990s. The equipment is donated by the printing community at home and abroad, some of which are now very rare (People's Daily, 2022). 'The China Printing Museum has a large volume, with three floors of exhibition halls, including two floors of above-ground exhibition halls and one underground exhibition hall. Among them, the 1st and 2nd floors introduce the history of printing in China and the world, and the 3rd floor is mainly a thematic display of printing equipment.' (Observation notes from the China Printing Museum)

'Although the whole of this is roughly by this time data, it is also divided into many units, ah, each floor has a lot of units or boards. It is like this.' (China Printing Museum Designer Interview) 'This is to make it known as the domestic unique professional museum so an important foundation, its exhibition of dust equipment, it is this mechanical equipment is very important, you ask these questions can be said just to ask the question of this building, and does not involve the underground part of it, but it is the underground annex building facilities is instead one of the most successful parts of him. A unique and stunning view.' (Chinese Printing Museum Visitor 1 Interview)

III. Wuhan Police Museum

The layout of the exhibition halls of the Wuhan Police Museum adopts a narrative structure, with the temporary exhibition hall on the ground floor displaying the theme of the fight against

the COVID-19 pandemic. In contrast, the permanent exhibition hall on the first floor focuses on developing the Wuhan police system. Specifically, the two exhibition halls on the ground floor of the Wuhan Police Museum are the multi-functional exhibition area and the special exhibition area, both of which are temporary exhibition halls, and the one currently on display is the 'Wuhan Public Security Epidemic Resistance Theme Exhibition'. This theme exhibition shows the hard work of Wuhan's police system staff in the aftermath of the Xin Guan epidemic. The collection of anti-epidemic items, commemorative medals, petitions, on-site photographs, and so on provides a comprehensive record of the fight against the epidemic by the police and the people of Wuhan. The contents of these two halls on the ground floor are not directly related to the contents of the history of the development of the Wuhan police on the first floor and are unique thematic exhibitions. Setting up a thematic exhibition, rather than integrating a part of the theme into the whole museum, helps the audience to focus on the same issue and is more conducive to a whole-body experience, thus causing emotional resonance.

'Let us say what we are doing now in our ground floor gallery. Our Wuhan ... Based on the fact that the New Crown Virus started in Wuhan, we are now displaying the deeds of some commendable people who fought against the New Crown Epidemic, all in this exhibition hall on the ground floor.' (Interview with Wuhan Police Museum staff)

This narrative structure of the exhibition deeply moved visitors; the thematic exhibitions on the ground floor allowed visitors to immerse themselves in the content of a section so that they could view the content of the exhibition more attentively, causing emotional resonance. 'For me, the most profound feeling is the epidemic of that plate, because in Wuhan, I experienced that epidemic, and then looking at these things, maybe with other friends from abroad to see these things is not quite the same feeling. There is a time I very want to cry. Well, it is the one that includes the handprints, um, and the one that has some images in the video, including some of the interviews at the time; it looks like it has all touched more.' (Visitor 4 interview) 'That period is quite special, but for us Wuhan people, it is quite special; maybe many people from other provinces or cities who have not experienced this period, it may be more difficult to resonate with him, he will feel a little bit of this exhibition hall did not understand, or it is difficult to be brought into it.' (Interview with Visitor 2, Wuhan Police Museum).

During the site visits to the three case museums, it was found that they all had pavilions that used a narrative structure to organise the exhibition halls. This structure fully highlighted the importance of individual exhibition exhibits through dedicated halls to display important historical events or core thematic content. Observations and interviews show that the narrative structure not only explains the history and culture behind the exhibits in a more detailed and precise way but also effectively triggers the emotional resonance of the audience. While visiting the exhibition, the audience can gain a more profound experience and empathy through this structure and deepen their understanding of the historical events and their impact. Therefore, the use of narrative structure not only enhances the educational value of the exhibition but also provides a more engaging experience for the audience to participate in and ultimately promotes a comprehensive understanding of history and emotional connection.

5.3 Exhibition Hall Layout Structure

Museums usually use a particular sequence to connect exhibition halls in series. From the viewpoint of the plan layout of each floor of the building, museums, based on the scale of the building, the content and nature of the display, and other factors, will divide the exhibition halls into different ways, each of which has its advantages and disadvantages (Chart 7). The spatial

arrangement of museum exhibition halls can generally be categorised into three fundamental types: the tandem layout, the radial layout, and the radial-tandem layout. These three configurations are among the most common in Chinese museums (Chen,2019). This section aims to discover the different layout structures of museums and their corresponding advantages and disadvantages

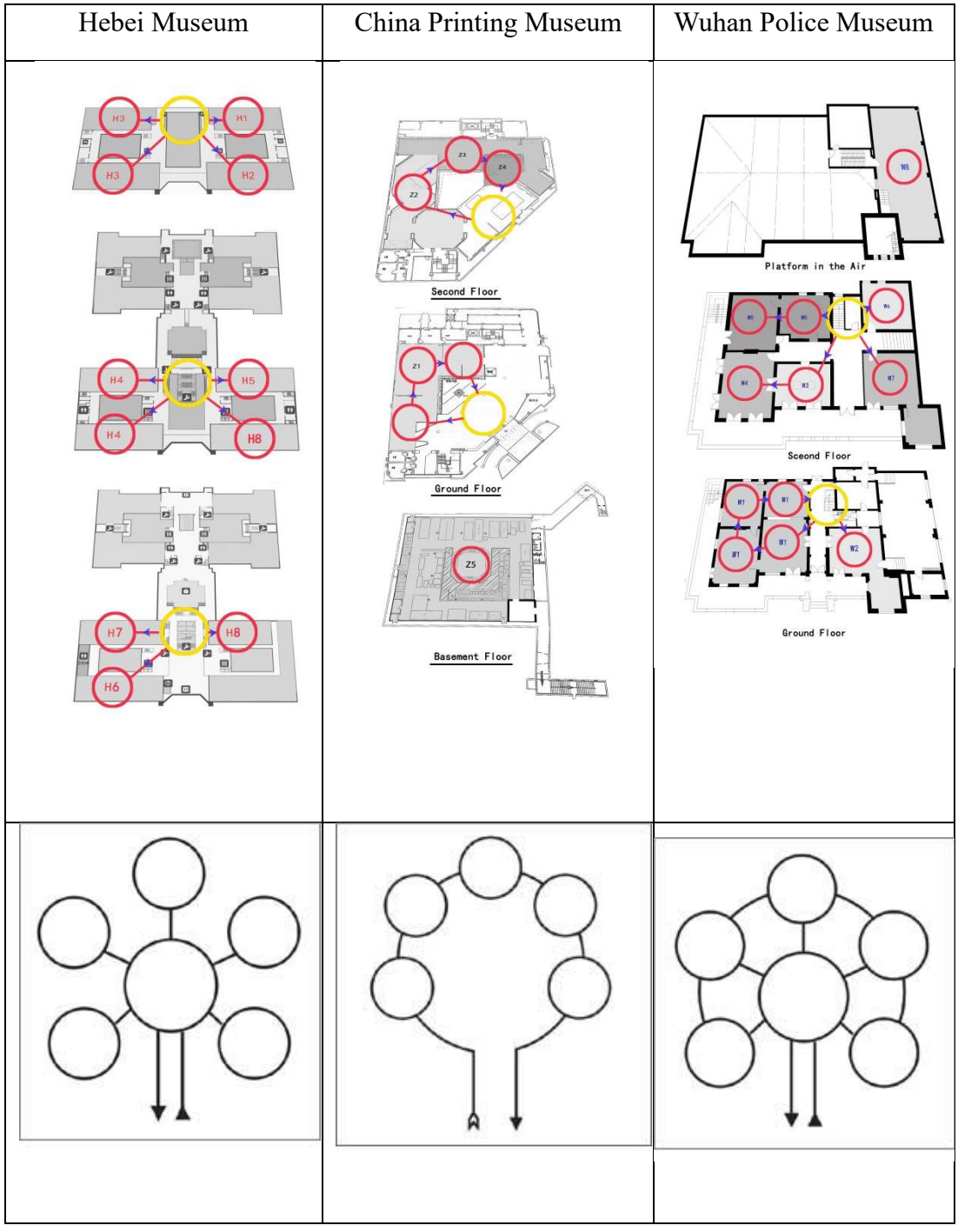


Figure7. Visitors' Route to the Museum

I. Tandem layout

The layout of the China Printing Museum exhibition halls is typical of a tandem layout, as seen

from the floor plan. The tandem layout means that the exhibition paths are arranged linearly or sequentially, and the audience needs to visit the exhibits according to the established routes. The advantage of this layout is that the flow of visitors is clear, the entrances and exits are clear, and the visiting path is not easy to make mistakes. At the same time, it is convenient for tourists to visit the exhibition units in sequence, which is suitable for small and medium-sized exhibition areas. The disadvantage lies in the single direction of visit, which is less flexible; for the audience with a clear goal, arriving quickly at a specific exhibition area may be more challenging.

'Because our pavilion has three floors and a clearer route to visit, most visitors should find it okay.' (Chinese Printing Museum staff interview)

'The exhibition paths in the tandem layout are arranged along a certain linearity or sequence, and visitors follow a specific route to visit the exhibits.' (Observation Source)

The design of exhibition halls with tandem layouts can help visitors complete the exhibition smoothly. The visitor path of the China Printing Museum starts from the ground floor. It extends upwards or downwards layer by layer, combining the chronological order and the theme of the equipment display so that the audience can easily browse the whole museum according to the logic of the exhibition. Its first and second-floor exhibition halls are both 800 square meters in size, and this tandem approach ensures efficient use of space and a logical sequence of exhibitions.

'So, you can see the advantage of the tandem layout is that it is highly guided. The tandem layout guides visitors through clear paths, enabling them to move smoothly from one exhibition area to another and reducing the possibility of getting lost.' (Observations)

'Upon observation, all five visitors tracked were able to follow the correct flow sequence. Visitors first entered the ground floor gallery, and due to the tandem layout adopted, there was no intermediate fork at the gallery entrance. As the 2nd floor still adopts a tandem layout, the tour flow is also clear, and all visitors follow the established flow of the design to complete the tour.' (Observation Information)

'The route of the layout is still clear and smooth.' (Chinese Printing Museum Visitor 4 Interview)

'It is very smooth, very smooth. This museum pavilion is through the tangent corners and constantly cuts the area so the plane gets tangled in the circle.' (Interview with Visitor 1, China Printing Museum)

Despite the tandem layout's significant advantages in terms of logic and guidance, the problem of its lack of flexibility remains. Visitors must follow a fixed route through the galleries in sequence, and this layout may cause some inconvenience for visitors who wish to travel quickly to specific exhibition areas. In addition, a precise location of entrances and exits is crucial, directly affecting the sequence of visits at a later stage.

'You see, although theoretically when people come out, they definitely go that way first, but I brought my brother over here to play, and he looked at this fun that came over first, so we thought at first that this was the entrance, but that side is the entrance.' (Interview with Visitor 3, China Printing Museum)

II. Radial layout

The researcher, through observing the plan drawings of the Hebei Provincial Museum and on-site observation, found that the layout of the exhibition halls belongs to the radial layout. This

layout is centred on a radiating hub (e.g., lift, hall, etc.), and the exhibition halls are arranged around the radiating hub so that after visiting one or a group of exhibition halls, the audience can go to other halls via the radiating hub. The advantage is that the visiting route is flexible. It is convenient for the audience with clear objectives to arrive at the specific exhibition area quickly, and at the same time, it shortens the visiting flow and saves time. The disadvantage is that it may make some visitors have difficulties understanding the exhibition's theme, especially without a clear order of visits.

Visitors widely recognise the flexibility of the radial layout. Visitors can freely choose the order of their visit according to their personal needs, especially when the space is ample and the pavilions are rich in content. This layout provides visitors with greater freedom of choice. For example, the exhibition halls of the Hebei Museum are located in the South and North Districts and cover artefacts from several historical periods, with convenient connections through radiating hubs.

'Hebei Museum is divided into the South Zone and the North Zone, and each area has three layers ..... Overall, I feel that each era brings a full experience to the visitor.' (Hebei Museum Visitor 1 Interview)

'The new museum and the old museum in terms of ..... the new museum is brighter, the place is bigger, and then the area of each pavilion is also bigger, the pavilions are interconnected, quite convenient.' (Hebei Museum Visitor 2 Interview)

However, the radial layout also has some limitations. Through the route tracking of five visitors, we found that this layout will cause some visitors to take the wrong route. If the radiating layout enters the wrong first gallery, then a series of errors can occur in the order of the galleries that follow. 'Radial layouts can lead to complex navigation between galleries, particularly for first-time visitors, and galleries may lack logical coherence due to their independent placement, distracting visitors from understanding the exhibition's theme. Without a clear guidance system, it may be difficult for visitors to judge where to go next on their visit.' (Observation Note)

III. Radial-tandem layout

The Wuhan Police Museum adopts a radial-tandem layout, which takes the central hub as the core and connects different exhibition halls through multiple radial exhibition lines. Its advantage lies in the flexible use of space, shortening the flow of visitors and improving the efficiency of information integration. The radial layout maintains the flexibility of space utilisation and optimises the viewing experience by displaying exhibits.

The radial-tandem layout can focus on the core information of the exhibition theme through the central hub, making it easy for visitors to obtain the overall pulse of the exhibition before visiting. As mentioned in the observation, 'There is a preface section behind the second floor of the Wuhan Police Museum, and although this section is small and does not serve as an independent exhibition area, it can serve as an information convergence point to provide core information on the exhibition theme and help the audience to establish an understanding of the overall exhibition.' (Observe the information) On the other hand, by arranging the exhibition halls around a central hub, visitors have a shorter travelling route, which can improve the efficiency of the visit and avoid staying too long in a particular exhibition area, affecting the overall rhythm of the visit.

However, the disadvantages are equally obvious. Due to the lack of a transparent guiding system,

some visitors may quickly lose their way during the visit, leading to confusion in the exhibition viewing experience. Visitors may get lost due to the complexity of the route. Due to the lack of a transparent guidance system in the radial layout, some visitors cannot visit the exhibition in the established order, affecting the overall understanding of the exhibition's content.

'After observation, it was found that visitors could visit the galleries in the correct order after entering the ground floor, but after entering the first floor, the tour route was generally confused. Only one visitor out of five could visit the galleries in the correct order after viewing the guide signs, and the first gallery visited by the remaining four visitors after entering the first floor was incorrect, which directly led to the incorrect routes of the later visits.' (Observation note)

Visitors also showed confusion when referring to the tour route. Some stated that it was challenging to plan the correct route unless they could discern the correct viewing route after several observations of the floor plan. This demonstrates the complexity of the tandem radial route.

'Well, I came to see ..... the first floor in order. I feel like there are more exhibition halls than on the ground floor. There should be four exhibition halls more closely lined up, right, but then I realised that the order given in the floor plan did not seem to be like that, so it seemed like I was not looking at it in chronological order during my visit, and there was a small quantity of confusion.' (Interview with Visitor 2, Wuhan Police Museum)

'On the first floor, there are more exhibition halls. When I looked at it, I realised that my tour route and the route he instructed me to take differed. I was taking that route. Anyway, it was dizzying at first, and there might be this duplication of routes to go through, so I think he will have to go through more of a planning process in this route.' (Interview with Visitor 1, Wuhan Police Museum)

Another common problem is the lack of clear entrance cues and exhibition sequence guidelines. For visitors unfamiliar with the exhibition hall layout, this lack of guidance can easily lead to missing parts of the exhibits or visiting in the wrong order.

'There might not be a big hint at the entrance either, telling me that it is the first exhibition hall, so I did not pay much attention to it, and then I just went in order.' (Wuhan Police Museum visitor two interview)

'On the first floor, I also looked at the right side first and then turned to the left side, and I felt that this aspect of guiding the flow of the displays did not seem to be particularly clear. We all go by our own subjective feelings; well, I usually start from the right.' (Interview with Visitor 3, Wuhan Police Museum)

However, although some visitors felt that the route was not clear enough, the uniformity of the display content guaranteed the overall viewing experience.

'The content displayed on the first floor is more unified throughout, so this does not greatly impact my view of this museum.' (Interview with Visitor 3, Wuhan Police Museum)

'I do not know the correct route, but my overall feeling is still relatively smooth.' (Visitor 3 interview)

Through field observations and visitor interviews at the China Printing Museum (tandem layout), the Hebei Museum (radial layout) and the Wuhan Police Museum (radial tandem layout), it can be found that the layout structure of a museum's exhibition halls has a significant

impact on the visitor experience and that the different layout styles have their advantages and disadvantages, and are suitable for different exhibition needs and building sizes. Tandem Layout. Its clear linear flow ensures the exhibition logic's coherence and visitor guidance's efficiency. It is especially suitable for small and medium-sized museums or exhibitions with an intense chronological sequence. However, its lack of flexibility may limit the independent choice of visitors. Radial Layout Connecting multiple exhibition halls through a central hub provides a high degree of visiting freedom and is suitable for large-scale comprehensive museums. However, the lack of a transparent guidance system may easily cause visitors to lose their way and affect the overall understanding of the exhibition's theme. Radial Tandem Layout Combines the characteristics of the previous two, optimising the efficiency of information integration while maintaining spatial flexibility. However, the lack of a straightforward guiding design may confuse the visiting routes.

6. Summary

This study aims to identify how museum galleries are laid out in China and explore these factors' role in shaping visitor experience and exhibition effectiveness. This study systematically sorted out and summarised the floor plan layouts of the China Printing Museum, Hebei Museum, and Wuhan Police Museum and coded the data collected through observation and interview methods at three levels, ultimately leading to the following conclusions (Figure 8):

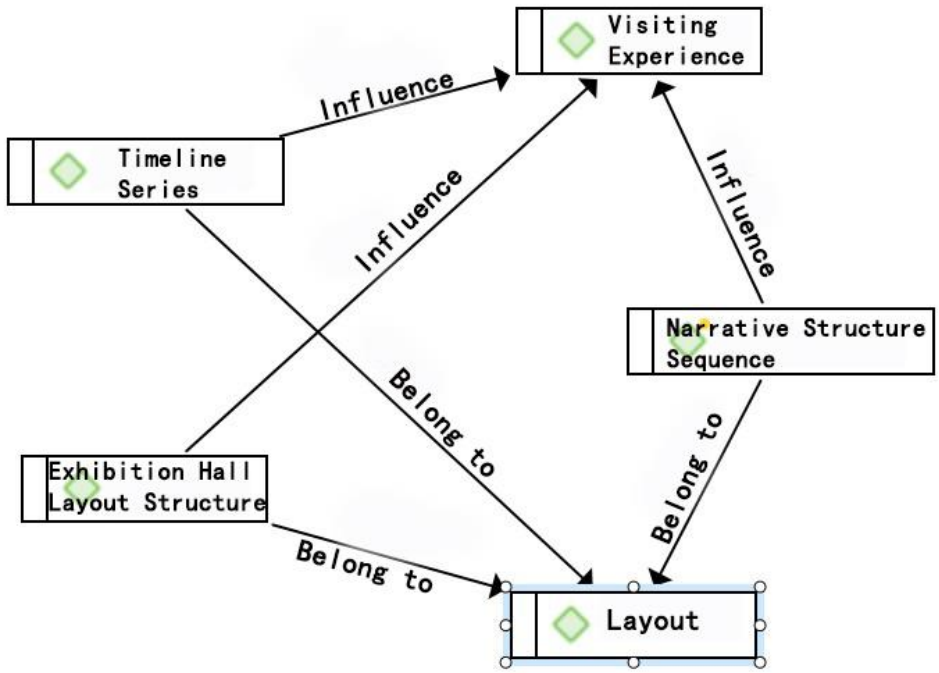


Figure8.Theoretical Framework for the Layout of Museum Galleries and Its Impact on the Visitor Experience

The floor plan layout of the exhibition hall is one of the core factors of the museum exhibition space, which plays a key role in the logic of the visiting route and the smoothness of the visiting experience. The three case museums adopt the two main layout methods: timeline sequence and narrative structure. By arranging the exhibition contents in the order of historical development

through the timeline sequence, visitors can gradually understand the contents along the time clues and feel the hierarchy and coherence of history. This layout not only helps visitors understand the core of the exhibition but also enhances the attractiveness of the exhibition through a logical and clear path design. The narrative structure pays more attention to the theme of the exhibits; for example, the 'Wuhan Public Security Epidemic Resistance Theme Exhibition' on the ground floor of the Wuhan Police Museum enhances the audience's emotional resonance and cognitive depth by focusing on important themes. Secondly, in terms of visiting routes, the layout of the three museums reflects the commonality of clockwise visiting routes. This design optimizes the visiting flow, avoids crossflow and confusion, and makes the exhibition experience more fluent.

Regarding the layout structure of exhibition halls, Chinese museums often adopt tandem, radiating, and tandem radiating layout forms between exhibition halls. Each layout form has unique advantages and limitations and should be reasonably selected according to specific projects' functional requirements and spatial characteristics. At the same time, these layouts should fully consider the possible shortcomings and develop targeted optimisation programmes to achieve a balanced unity of function and exhibition experience. The structural layout of museum exhibition halls should consider the exhibition's content, the building's scale, and the target audience's needs.

In summary, the commonalities and differences in the plan layout of different museum exhibition halls indicate that the space design needs to consider the functionality, audience needs comprehensively, and exhibition themes to achieve better cultural dissemination and public service effects. In addition to addressing the advantages and disadvantages of different types of exhibition hall layouts, it is recommended that audience behavioural simulations be conducted at the early stage of curation to optimise path planning and enhance the overall exhibition effect. At the same time, the design of the future museum can enhance the freedom of visiting while ensuring the logical coherence between exhibition halls to balance the spatial efficiency and the exhibition experience.

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