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Exploring the motivations of young museum users through identifying personas based on Bartle's taxonomy of players

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Services tailored according to users' unique preferences can attract users' continuous attention. In view of the fact that studies have shown that gamification can improve the engagement and satisfaction of young museum visitors, combined with the persona technique, the Bartle's taxonomy of player types as a gamification-based model hopefully enlighten administrators and researchers to understand the issue of museum visitor composition. So, the persona selection process was described in more detail in the study, as well as triangulated data was collected, including service safari, shadowing, retrospective interviews, and experience cards. This research found that the intrinsic motivations of Gamification-based personas are both distinct and shared. In the context of the museum, these motivations vary across the four personas. Explorer values autonomy in discovering and understanding museum offerings, Socializer seeks relatedness by engaging with others both inside and outside the museum, Attacker pursues competence through challenging and competing against fellow museum-goers, while the Achiever gains competence through personal accomplishments within museum activities. Despite these differences, some intrinsic motivations overlap. Explorer and Socializer are driven by museum exploration, while Socializer and Achiever value social connections within the museum context. Achiever and Attacker take pride in their accomplishments, and Explorer and Attacker are curious about the museum's unknowns. This illustrates that in meaningful gamification, the distinct intrinsic motivation is the key motivation for people's engagement in museum activities in different ways, and this is their real motivation for entering the museum. This research recommends that it is not necessarily to develop different kinds of museum exhibitions for each motivation or combination of motivations but to find methods to use the services to meet individual needs. Considering the 40 ancient building cultural relics protection institutions in Beijing, this research can inform other historic house museums and help validate and refine the proposed improvements.

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Introduction

The museum is a crucial factor in the cultivation of the populace, and it can measure the strength of a country to a certain extent (Jian & Li, 2014; Pirnazarovna, 2024). In the past half-century, the museum's concept of "exhibit-oriented" has changed from collection-centric to the "visitor-oriented" concept of serving the public (Ma & Cheng, 2019; S. Deng, 2016; Feng, 2017; An, 2019). In terms of the degree of Chinese citizens' engagement in the museum, compared with the 3-5 visits per year in developed countries, each citizen in China enters the museum about once every two years on average. It is not because the exhibition is not wonderful, but the museum service cannot better satisfy the visit experience (Bai & Xu, 2017; Liu & Liu, 2017). Although the overall participation is not high, the research on population composition found that the young people have been the main users of museums currently. Fang (2018) and Zhang (2019) presented strong evidence that more than half of visitors to the Palace Museum in Beijing are young people under 30. Similarly, statistics from the Shanxi History Museum and the Capital Museum also showed that the number and frequency of visits to museums by young people under 39 are the most. Fang (2018) also found some museum-themed documentaries and variety shows have also won wide attention from the generation born in the 80s, 90s and 00s (accounting for 97% of the total audience). This shows that young Chinese people determine the future audience of the museum (Izzo, 2017; Cesário & Nisi, 2023). However, given the low frequency of museum visits in China as a whole, the frequency of visits by young Chinese people is still lower than that of some developed countries, and the habit of young people participating in museums still needs to be cultivated.

Studies suggested that gamification can facilitate the improvement of users' engagement and increase the satisfaction of individuals, especially for young museum visitors (Lans, Ansems, & Khan, 2016; Kristianto et al., 2018; Nofal et al., 2020). As user research, however, it is undeniable that young visitors are still a large group. Under the guidance of the museum user segmentation concept in museum branding (Espiritu, 2018), Gamification-based persona can be understood as the practice of player type research in the design process of gamified systems for non-gaming environments (Hopfgartner, 2015). As the persona refers a specific fictional person as an archetype to represent a group of people with shared characteristics, in the museum context, (McDonald, 2005) proposed that it is beneficial to develop personas to comprehend the wider context of user needs. More importantly, combined with persona technique, it helps to focus on valuable user groups (French, 2016). Faced with issues aforementioned that keep young people engaged in museums, the purpose of this research is to enhance the user experience (UX) by exploring the services of the Palace Museum to provide stories of how the representative users perceive the museum.

Selecting a case is more beneficial when the researcher aspires to detail and depth (Denscombe, 2007), and Bryman (2012)) emphasized the selection of cases and units. In this study, the Palace Museum in Beijing, China was selected. As one of the most prestigious historic house museums in China and the world, the Palace Museum is similar in essential aspects with other museums that might have been selected, hence the findings from the case study of the Palace Museum are likely to apply to other similar museums.

Background, literature review, and problem statement

Services tailored to users' unique preferences can more arouse users' continued attention (Akasaki et al., 2016). As Espiritu (2018) stated that museum brands need to be accurate and

specifically communicate with designated target groups. In recent years, the museum has no longer tried to attract the public, because it can be said that there is no "public" anymore. Therefore, museums need to segment visitors to a certain level (Espiritu, 2018). As stated by Akasaki et al. (2016) that services tailored to users' unique preferences can more arouse users' continued attention. Therefore, exploring the museum service based on different user motivation is still a knowledge void. Other scholars have also made similar claims. Shen Maosheng, who works at the Emperor Qinshihuang's Mausoleum Site Museum, believed that the first thing to do is to understand the visitor composition of the museum (Tian, 2018). Coincidentally, Falk and Dierking (2013) also made a similar statement earlier: "it is important to understand who your visitors are and develop an interpretive plan will meet their needs and interests." According to earlier literature, in the context of museum UX, Neumeier (2005) and Kim (2008) also believed that different individuals determine distinct perceptions. The current question is how museum visitors can be effectively segmented. Falk and Dierking (2013) further point out that identity-related motivations provide crucial insights into how visitors perceive and engage with their museum experience. Falk (2022) also emphasized that, if the individual's identity-related motivations align with their perceptions of the museum, they are more likely to view the museum as a suitable venue for a leisure experience. Unlike traditional methods of audience segmentation, which often categorize visitors by factors such as age, race/ethnicity, gender, or education level, segmenting visitors according to their identity-related motivations offers a more meaningful understanding of their actual experiences. This approach allows for a deeper, more nuanced exploration of how individuals relate to and make sense of their museum visits, offering valuable perspectives beyond demographic characteristics. However, in the museum context, the research to date has tended to focus on "the public" rather than the subdivided users; thus, the diverse motivations of different types of visitors are rarely considered. Falk and Dierking (2013) divide the reasons why visitors go to museums into seven types, but this is not a classification of people; rather, it explains the motivations for their visit on a specific day, and these motivations may fluctuate on different occasions, including on subsequent days. Falk and Dierking's approach, while valuable, focuses on motivations that can fluctuate between visits, lacking the stability needed for long-term strategy development. In this research, the researcher aims to adopt a more stable approach that provides consistent insights into user needs. The stability helps to better understand long-term engagement patterns, enabling more effective and targeted strategies to enhance the museum experience.

In view of the fact that many studies have shown that gamification can improve the engagement and satisfaction of young museum visitors, which is consistent with the researcher's opinion that the application of gaming metaphors to real life tasks is beneficial to understanding user motivation, participation, and experience (e.g., Zichermann & Cunningham, 2011; Döpker, Brockmann, & Stieglitz, 2013; Hamari, J., & Koivisto, 2015; Aalst & Boogaarts, 2002; Koppolu, 2016). For the museum, it is not only an educational institution, but also provides visitors with experiences such as entertainment (Li, 2017), using gamification-based player types offers a comparatively stable framework for understanding visitor motivations. Unlike other segmentation methods, which may focus on varying demographics or short-term engagement, the intrinsic motivations of player types provide a more consistent foundation, enabling the development of long-term strategies to enhance the museum's ongoing appeal. Studies shows that gamification of offering rewards is suitable for

the short-term purpose; Over time, however, the role of rewards should be gradually reduced and replaced by ongoing meaningful engagement (Nicholson, 2015). Specifically, gamification is the use of elements of game design in non-game contexts (Deterding, S., Khaled, R., Nacke, L., & Dixon, 2011). As Nicholson (2012) commented: “meaningful gamification encourages a deeper integration of game mechanisms into non-game contexts.” This illustrates designers of user-centered meaningful gamification cannot rely on the stereotyped meaningless points methods to bring external rewards, and they should help users connect the gamification process to their background. In a user-centric philosophy, the Self-Determination Theory (SDT) shows how to make systems that help users find their reasons for engagement through constructing intrinsic motivation (Ryan & Deci, 1985). As a motivational theory, SDT investigates a large-scope of situations across gender, culture, age, and socioeconomic status by focusing on the psychological level (Deci & Ryan, 1985, 2015). In the SDT theory, the following three basic psychological needs have been proposed: the needs for competence, autonomy, and relatedness. By analyzing the framework of gamer psychology—types of players proposed by Bartle (Achievers, Socializers, Explorers, and Killers), Nicholson (2015) connected the player types to the three categories of intrinsic needs in SDT, and concluded as follows: using gamification systems, Socializers tend to meet and engage with others, they are interested in the relatedness concept in SDT; try to break the boundaries of the gamification system, Explorers desire to participate in breadth, they value the concept of Play and pay special attention to the autonomy element; Achievers are looking for a feeling of accomplishment, they highly value the competence (mastery) needs; Attackers expect competition and conquest and value the mastery element in SDT.

Drawing on an extensive range of sources, (Kocadere & Çağlar, 2018) concluded the application of gamification must clearly grasp the player’s motivation, and the type of player must be considered in the design (Kocadere & Çağlar, 2018). Consequently, tailoring gamification according to player types is the first step towards personalization (Lopez & Tucker, 2019). By referring to the literature, the Bartle’s taxonomy of player types focuses on the intrinsic motives of people when playing games (Bartle, 1996; Bartle, 2004). Additionally, Bartle’s taxonomy is not only considered the most fundamental method for player type classification (Ferro et al., 2013), but also recommended by (Werbach & Hunter, 2012) for use in gamification to help accomplish something non-gaming. If Bartle’s player type is used as a model for persona selecting in this study, it is expected to interpret the distinct motivations of different kinds of museum users. As this research mainly emphasized individuals’ distinct motivations rather than the so-called general public, combined with the persona technique, the Bartle’s taxonomy of player types as a gamification-based model hopefully enlightens administrators and researchers to understand the issue of museum visitor composition proposed by Tian (2018) by focusing on the museum visitors’ distinct intrinsic motivation rather than extrinsic motivation.

Historically, as for the personality and play style, many gamer psychology models have been proposed, and many researchers proved that all player types that based on Richard Bartle’s four player types (Skopljaković, 2019). It is understandable that current gamification models for describing player types and motivations each have their unique strengths and limitations. Nicolle Lazaro’s 4 Keys 2 Fun framework focuses on emotional experiences in gaming, categorizing different types of fun: Easy Fun, Hard Fun, Serious Fun, and People Fun (Lazaro, 2021). However, it lacks an in-depth analysis of long-term behavioral motivations, makes it less applicable to museum user research, where

motivations differ from the immediate entertainment needs of gaming. Likewise, Nick Yee and Nicolas Ducheneaut’s Gamer Motivation Model categorizes motivations into six broad types, each with two subcategories, resulting in 12 distinct motivations. This model serves as a foundational framework for analyzing adolescent players (Yee, 2007; Yee & Ducheneaut, 2022). While detailed, it is designed for online game users, focusing on motivations within virtual environments. When applied to museum user segmentation, it may struggle to capture behavioral differences in physical spaces. Additionally, the model’s 12 categories may introduce complexity, increasing application costs and reducing efficiency in the museum context. Similarly, Marczewski’s Gamification User Types categorizes users into six types based on intrinsic motivations (Tondello et al., 2016). However, the complexity of the classification may reduce its clarity and efficiency when applied to museum user segmentation. Meanwhile, Amy Jo Kim’s Social Action Matrix, based on social and casual games, categorizes players according to their social interactions and engagement (Kim, 2024). While it effectively highlights social motivations, it may not fully address the diverse needs of museum users, who are also motivated by exploration, learning, and accomplishment. Drawing on an extensive range of sources (e.g., Manero, Torrente, Freire, & Fern, 2016; Konert, Göbel, & Steinmetz, 2013), it turns out that the one of the earliest models was the Bartle taxonomy, which is also the most cited, the most durable, as well as the most thorough and influential model based on play-styles. Also, previous literature proved that Bartle’s taxonomy of players works effectively in a gaming environment (Konert et al., 2013), and Bartle’s taxonomy and the way to understand the audience are the foundation of considerable subsequent gamification (Christians, 2018). Specially, the research of (Vallarino et al., 2020) showed that applying Bartle taxonomy of player types to corporate internal training can maximize participation, and other studies such as Redfern and McCurry (2018) as well as Maxwell (2016) indicated the employment of Bartle taxonomy can strengthen learning in the teaching process. Overall, a large number of studies have shown that the introduction of Bartle taxonomy can increase user engagement. In addition to what was mentioned earlier, Falk and Dierking (2013) proposed that museum users’ identity-related visit motivations represent a useful method to understand the visitors, which further confirmed the feasibility of applying Bartle taxonomy to museum user research.

Based on Bartle’s taxonomy, this study applies it to the museum context by selecting personas that represent different user types with distinct motivations. Therefore, in line with the issues mentioned above, the research question is: What are the motivations for different personas to visit the museum?

Methods

This section reports the methods used in this study, as well the strategies for data analysis. It primarily explains the selection of personas, then discusses data collection procedure, data transcribing, and data analysis.

Selection of personas. Combined with the previous statements: (1) Stickdorn et al. (2018) indicated that approximate three to seven core personas representing main market segments should be created when developing customer personas. If the number of persons created exceeds this range, people will not really use them in their work because they cannot remember all them; (2) Jung et al. (2017) proposed that typically persona generation has focused on a small number of personas (three to six). Accordingly, using persona technique to recruit only four informants (select one person for each from one taxonomy) based on

Bartle (2004), this UX investigation places more emphasis on depth and richness rather than larger number of informants. Overall, smaller informants would almost certainly be necessary for experience-centric qualitative research (McDonald & Simpson, 2014). The choice of personas ignored factors such as gender, nationality, and job, as Stickdorn et al. (2018) stated that the criteria such as demographic information or geographical similarities is misleading for generating personas in service design research. Coincidentally, Falk (2016) also mentioned almost the same point in his own words: “Although almost every museum has attempted to count and sort their visitors based upon demographic categories—age, gender, race/ethnicity, income, education, and occupation—these categories yield a false sense of explanation.” After understanding the above proposition, in this study, the persona technique was used to identify specific target subgroups based on gamification. Returning briefly to the issue of player types in the literature review, the player is at the root of the gamification and Bartle (2004) identified four types of players according to human personality for playing a game: Achievers, Socializers, Explorers, and Killers (the researcher renames Killers as Attackers) (Fig. 1). Bartle found that Achievers and Explorers were more interested in the game world (environment) than in other players, while Attackers and Socializers were more inclined to focus on players. When turn to the other axis, Attackers and Achievers were actively interested in acting, while Socializers and Explorers prefer to interact. In this service experience research, specifically, four personas (Achiever, Socializer, Explorer, and Attacker) were identified based on types of players to represent different types of visitors in the hope of exploring their distinct motivations. Through the innovative persona selection process, the selection of participants is closely relevant to the proposed research questions. As an interesting procedure, to represent different types of visitors, this section described the detailed process of selecting personas and presented the background of four personas.

Based on the above taxonomy established by Bartle, Andreasen and Downey developed a questionnaire (GamerDNA test) for the Bartle Test of Gamer Psychology to identify gamers’ playing style preferences that predominates in a group of players. According to Konert et al. (2013), this test already collected data of more than 200,000 recipients. However, this version of the Bartle Test is now offline. Thus, based on the same underlying data/questions as the GamerDNA test, Dr. Matthew Barr, who works at the University of Glasgow, has implemented his version (Barr, 2013).

The researcher corresponded with Barr by email several times, and he gave the consent for this research to use his implementation of the online test. Furthermore, he emailed the question pool and some principles for building the test. Drawing on an extensive range of sources, especially the mail conversation with Barr, the researcher knows that there are a total of 39 questions in

the pool, in detail, the number of groups for each combination are: S/A (7), S/E (6), S/K (7), E/A (6), E/K (7) and K/A (6). Accordingly, the script takes 30 questions at random but checks that there are an equal number of questions for each player type combination. In this way, one of the choices relates to one specific playing style preference. Thus, the questionnaire works by asking questions for each combination of two different Bartle playing style preferences (e.g., Socializer vs. Achiever) and adding the numbers to get the score. For instance, the following provides an example of excerpt with a question and two alternative answers: if one participant chooses the first option in the following socializer vs. Achiever question, he or she adds one to his or her Socializer (S) score; conversely, if the second option is selected, it will add one to Achiever (A) score.

Are you more comfortable, as a player on a MUD:

(+S) *Talking with friends in a tavern?*

(+A) *Out hunting orcs by yourself for experience?*

The result of the Bartle Test is known as the “Bartle Quotient.” As a test of personality types, this test displays the final result as categories. In other words, one of the personality categories will be provided for him or her based on how they answer questions about the quiz. Simultaneously, the test results also incorporate percentages to show how much a participant tends to have a certain personality. Specifically, the “Bartle Quotient” computed according to the individual answers that grant a 200% entirety in four categories of preferences, without any separate style achieving above 100%. For example, a user gets a result with “100% Socializer, 50% Explorer, 30% Achiever, and 20% Killer”, which indicates the player’s motivation for playing is collaborating or interacting with others more than an alternative style of interests. This result may be abbreviated as SEAK.

The first step in categorizing respondents is to choose who will participate in the questionnaire test. According to the definition of young people in the Chinese government document *National Medium and Long-term Youth Development Plan (2016-2025)*, the youth age range is 14-35 years old (The State Council, 2017). In line with this, the 2023 *Museum Data Report* from a short video platform indicates that individuals born after 2000 engage more with museum-related videos compared to other age groups. Notably, nearly 50% of those following museum information are between the ages of 18 and 30, with university students emerging as the primary demographic for museum audiences (Zhejiang, 2023). Therefore, the data collection in this study targets young Chinese museum users. As for the selection of respondents, social research is frequently based on convenience sampling (Bryman, 2012). In addition, since player types are not influenced by demographics, and based on the previous analysis of young people, this study decided to use convenience sampling. Accordingly, the participants who were invited to answer the Bartle Test online questionnaire were the researcher’s undergraduate students (freshman and sophomore students) from six different classes with a total of 126 students who were in the researcher’s class during this semester. Finally, each respondent who completed the test submitted a screenshot of the results, and a total of 99 screenshots of test results collected from six classes with a total of 126 students. Then the 99 respondents can be judged which player type he or she predominantly belong to according to which category achieves the highest score among the four.

After obtaining 122 results from 99 initial results (see Table 7 for a complete table), the researcher used Microsoft Office Excel software to classify the test results. As the beginning of the statistics, the researcher input the four scores (percentages) of

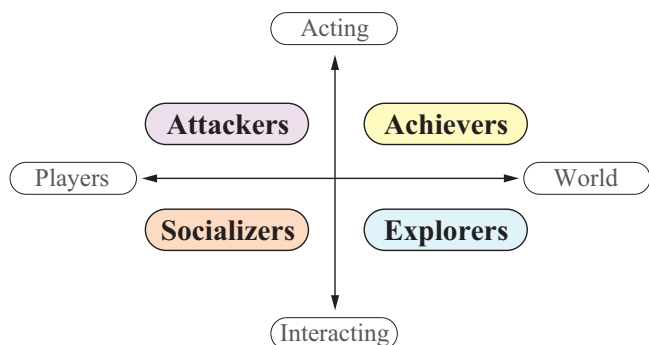


Fig. 1 The Bartle’s taxonomy of player type as a gamification-based model (Bartle, 2004).

each participant in the four taxonomies into four excel columns according to the screenshots of test results. Interestingly, it found out in the test results that some respondents have their two or more equal dominant identity-related characteristics, which determines the overall preferences of their composite type. For instance, in the following Table 1, the respondent ZCHD got a result with “53% Socializer, 53% Explorer, 53% Achiever, and 40% Killer (Attacker)”.

Having discussed how to classify respondents into four categories, the following addressed the method of selecting four desirable personas from the above candidates. As discussed above,

respondents judged which player type he or she predominantly belongs to according to which categories gain the highest percentage among the four. However, there are many personas in each category. How to choose the four most suitable personas from a large number of candidates is the issue that this part deals with. Frankly, this is a process of continuously narrowing the scope of the persona.

Firstly, the researcher selected several candidates that are most likely to be the final personas from each of the four categories S (Socializer), E (Explorer), A (Achiever), and At (Attacker). In the list of each group from high to low, the researcher initially focused on the top-ranked candidates with higher scores. The reason why the researcher focuses on a few candidates rather than just the highest score is that this study employed other multiple criteria later to increase the reasonability of the persona selection.

Accordingly, another essential criterion is the difference between the highest score and the second-highest score, the greater the difference, the better. Based on this, the researcher calculated the difference that the highest score of each respondent subtracts the second-highest one by using the Microsoft Office Excel, and the respondents who have obtained “high differences” here are also receiving attention. After combining the primary criterion “high score” and the second criterion “high difference,” the researcher set the two fundamental criteria that are simultaneously indispensable: (1) The percentage of the highest category is greater than or equal to 80%; (2) The difference between the highest score and the second-highest one is greater than or equal to 20%. According to these two indispensable criteria, the researcher initially selected three Socializers, two Explorers, two Achievers, and four Attackers (Table 2).

Secondly, after narrowing the scope of the personas pool, the researcher got in touch with these candidates to further narrow the candidates through face-to-face brief interviews and WeChat interviews. Combining the qualitative findings and the quantitative results reduces the limitations of using a single method (Bryman, 2012). The first question is: “Did you comprehend the questionnaire and complete it by yourself?” In response to this question, 10 of the 11 candidates answered “Yes,” and only one candidate (HRL) asked a friend to complete the questionnaire since she could not open the test page on her smartphone. Therefore, this candidate who did not personally answer the

Table 1 An excerpt from the 122 results.

Respondents with 122 Results	S (Socializer) %	E (Explorer) %	A (Achiever) %	At (Attacker) %
Socializers (37)				
CXY	87	67	47	0
GQ	80	53	13	53
YZH	80	47	20	53
ZCHD	53	53	53	40
...				
Explorers (33)				
CHHF	60	93	40	7
ANLJ	60	87	20	33
ZHBH	60	80	27	33
ZCHD	53	53	53	40
...				
Achievers (28)				
ZHMW	33	40	80	47
CHNB	40	27	80	53
YSQ	33	27	73	67
ZCHD	53	53	53	40
...				
Attackers (24)				
WUHJ	53	20	40	87
HRL	53	20	47	80
YQ	20	40	60	80
LHY	13	60	47	80
...				

Table 2 Selection criteria of the four desirable personas.

Candidates	Four types of players' playing style preference (%)				The Highest Subtracts Second Highest (%)	Did You Comprehend the Questionnaire and complete it by yourself?	Is the Test Result Consistent with Your Motivation?	How Often Do You Play Games? 1. Very Frequently 2. Frequently 3. Sometimes 4. Seldom 5. Rarely 6. Never	Selected as Personas
	S	E	A	At					
Socializers									
	≥80				≥20				
CXY	87	67	47	0	20	✓	✓	2. Frequently	✓
GQ	80	53	13	53	27	✓	Uncertain	5. Rarely	
YZH	80	47	20	53	27	✓	✓	4. Seldom	
Explorers									
		≥80			≥20				
CHHF	60	93	40	7	33	✓	✓	3. Sometimes	✓
ANLJ	60	87	20	33	27	✓	✓	3. Sometimes	
Achievers									
			≥80		≥20				
ZHMW	33	40	80	47	33	✓	✓	3. Sometimes	✓
CHNB	40	27	80	53	27	✓	✓	5. Rarely	
Attackers									
				≥80	≥20				
WHJ	53	20	40	87	34	✓	Uncertain	6. Never	
HRL	53	20	47	80	27	×	Unknown	6. Never	
YQ	20	40	60	80	20	✓	✓	3. Sometimes	✓
LHY	13	60	47	80	20	✓	✓	3. Sometimes	

Personas Designing for types of game players

CXY



Socializer

Name	CXY
Age / Gender	19 / Female
Occupation	First-year university student
Mobile phone system / brand	Android / Xiaomi
Lifestyle	Occasionally cosplay, participate in the Comic con to meet new friends.
Bartle test result	SEAK (87% socializer, 67% explorer, 47% achiever, 0% killer)
Playing style preference	Education simulation game, games of multiple endings
Favorite games	Arena of Valor, Game for Peace, and Food Language

Experience goal

Unlock different endings with different communication options.
Meet different people through voice chat.

Personal statement

I like to communicate with people from different places.

Fig. 2 The persona card: Socializer.

questions was “eliminated.” Despite this, the researcher continued to ask her subsequent questions to make an overall judgment.

Third, as the process of narrowing the selection scope is an evolving process, the second question was asked, “Is the test result consistent with your motivation?” For this question, as shown in Table 2, except for three answers that are “Uncertain” or “Unknown,” other respondents say that the test result is consistent with their motivations. Even though candidates who answered “Uncertain” or “Unknown” cannot exclude immediately, their answer does not mean that the test results are not in line with their motives, but that he is not clear about himself. However, it’s known from the following questions (about the frequency of playing games) that they gave such answers because they rarely or never play games.

Fourth, the final question asked with, “How often do you play games?” To make it easier for respondents to answer this question, the researcher has provided a set of answer options based on the Semantic Differential Scale, from “Very Frequently” to “Never,” to determine the frequency of participants playing games. As shown in Table 2, except for the fact that no one chose “Very Frequently,” several other options were all selected by interviewees. In detail, almost half of the respondents chose the median value “Sometimes,” indicating that most of them have played the game. If these candidates selected as personas, it will help them to give some gamification advice in the later interviews.

For the two percentage values described above and the answers to the three interview questions, if the researcher refers to an item alone, it does not make sense in the persona selection. Therefore, it is necessary to synthesize all the factors for desirable persona selection. For example, when the persona of Achiever was determined, the scores of the two candidates in this category are the same. However, for ZHMW, the difference between the highest score and the second-highest score is higher than that of CHNB. Also, ZHMW did not hesitate to say she plays the game more frequently, so in the end, ZHMW identified to be the Achiever (Table 2).

When determining the role of the Attacker, although two candidates have high percentage values, they never play games. Thus, they are not sure whether the test results are consistent with their motivations or not. As can be seen from Table 2, after excluding these two candidates who never play games, the other two candidates are the same in all respects. In this case, the

researcher had in-depth communication with the two candidates and found that YQ had a deeper understanding of the game. Also, the researcher discovered that he was very decisive and specific in answering the questions. For example, he did not hesitate to tell the researcher that the test result is consistent with his motivation, and he said that he plays about two hours a day (the researcher did not have to ask the specific time). Accordingly, YQ identified to be the Attacker.

Having identified four personas by introducing the Bartle Test of Gamer Psychology based on players’ type theory, the researcher will now move on to present all the four personas. To innate, each persona described into a card, and all the cards help the researcher in finding the distinct motivations the museum service should satisfy (Figs. 2–5).

Data collection and data analysis

Data collection. In this study, based on the Service Design (SD) approach, triangulated data were collected using observations (service safari and shadowing) and interviews (retrospective interviews). Specifically, contextual interviews are used to better understand the needs, emotions, expectations and environment of a specific group of people, and are useful for the personas (Stickdorn et al., 2018). Additionally, it is worth noting that the Semantic Differential Scale-based experience cards are used during observations and interviews to help personas to recap their experiences (Fig. 6).

Specifically, the core of the SD process is the user and insights into user behavior, and the first-hand data comes from direct observation in fieldwork (Roto et al., 2018; Melnikova & Mitchell, 2018). That is, for specific purposes, observation employs more direct pieces of evidence of the eyes (Denscombe, 2007). Under the umbrella of observation, as previously stated, the service safari and shadowing methods were adopted to enable the researcher to gain an in-depth understanding of experiences from the participants’ perspective. Combining service safari and shadowing methods with in-depth retrospective interviews afterward to cross-examine observed situations, the researcher tries to grasp the reasons behind why personas make particular behavior, as well as their motivations and recommendations (Stickdorn et al., 2018). Inspired by Stickdorn et al. (2018), in the above process, experience cards with touchpoints are used for recalling past experiences (Fig. 7).

Personas Designing for types of game players



CHHF



Explorer

Name	CHHF
Age / Gender	21 / Male
Occupation	Second-year university student
Mobile phone system / brand	Android / Vivo
Lifestyle	Reading books
Bartle test result	ESAK (93% explorer, 60% socializer, 40% achiever, 7% killer)
Playing style preference	Story-based game
Favorite games	This War of Mine, Games of mutiple endings such as Galgame

Experience goal

Unlock all story clues or all story endings to understand the differences; explore or unlocked Easter eggs (an Easter egg is a hidden video game feature or surprise).

Personal statement

Study hard and make progress everyday.

Fig. 3 The persona card: Explorer.

Personas Designing for types of game players



ZHMW



Achiever

Name	ZHMW
Age / Gender	23 / Female
Occupation	Second-year university student
Mobile phone system / brand	iOS / iPhone
Lifestyle	Watching some videos or live broadcasts about games during free time
Bartle test result	AKES (80% achiever, 47% killer, 40% explorer, 33% socializer)
Playing style preference	Competitive games
Favorite games	League of Legends, CS:GO, and Arena of Valor

Experience goal

Experience the victory in games and upgrade to the level of the king.

Personal statement

look for the joy of life.

Fig. 4 The persona card: Achiever.

Falk and Dierking (2013) pointed out that it is indispensable for the visitors' experience both inside and outside the museum, before and after the visit. Furthermore, Falk and Dierking (2013), Liu and Liu (2017) in their study, noted that the visitor experience of the museum is divided into three stages: "pre-visit," "during-visit," and "post-visit." These viewpoints also coincided with the proposition of French (2016) that the visitor journey begins before the museum visit and continues long after they exit. To sum up, the SD approach "pre-during-post" may help to provide stories of how the users perceive the museum. Accordingly, the four selected personas experienced service touchpoints of the Palace Museum in the order of pre-visit, during-visit, and post-visit. In the process of during-visit, personas need to go to the museum to conduct service safari and could be shadowed (Fig. 8). In contrast, the investigation of the pre-visit and post-visit phases is done in the virtual environment with smartphones and other devices (e.g., VR glasses). Subsequently, the videos and screen recordings recorded during the above process were transcribed in the qualitative data analysis

software NVivo (Fig. 9), while the interviews and experience cards were manually transcribed in Microsoft Office Word.

Credibility checking. At this stage, triangulated data has been collected. Undoubtedly, triangulated data itself is an effective method for verification. For the aim of avoiding conspicuous biases and mistakes made throughout transcription as much as possible, this study also checked the transcripts and the analysis process through the following stages.

First, the researcher reviewed the errors and consistency with the original data. After going through the original data to Chinese, as well as Chinese to English, the researcher checked again by comparing the raw video, Chinese, and English, and then initially eliminated the mistakes. Next, the researcher invited the four personas to assist in checking the accuracy and credibility of the transcripts (Fig. 10). It is also called "member checking" (Creswell, 2009), "respondent validation," or "member validation" (Bryman, 2012). Additionally, when all the raw data has finally transformed into texts, the researcher invited an expert

Personas Designing for types of game players



YQ



Attacker

Name	YQ
Age / Gender	18 / Male
Occupation	Second-year university student
Mobile phone system / brand	Android / Xiaomi
Lifestyle	I like to go to different places to take photos, a veritable game enthusiast.
Battle test result	KAES (80% killer, 60% achiever, 40% explorer, 20% socializer)
Playing style preference	Competitive online games, games with ladder ranking system
Favorite games	League of Legends, Rainbow Six, and Overwatch

Experience goal

Challenge others and make myself a higher ranking in the process of killing.

Personal statement

If your game skill is too bad, then you are course be killed.

Fig. 5 The persona card: Attacker.

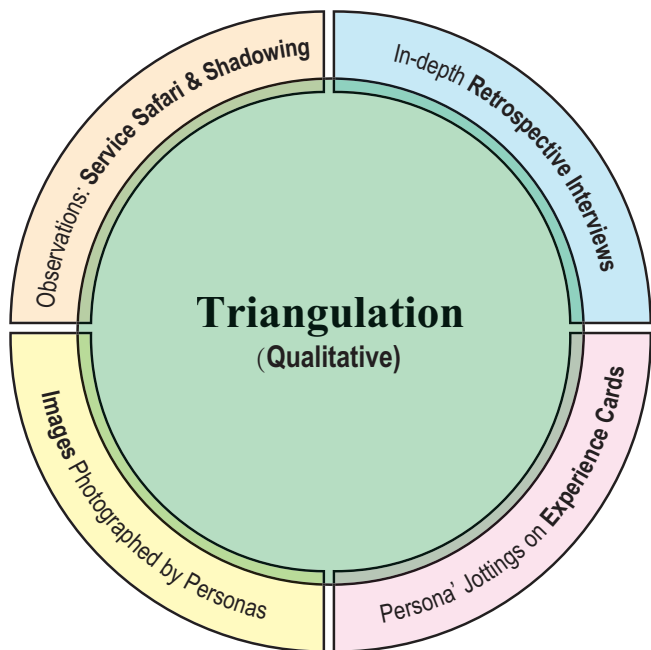


Fig. 6 Triangulated data used in this research.

who is competent in both Chinese and English languages to check, amend, and certify that the translation of Chinese to English is true and accurate.

In the following section of the data analysis, efforts to minimize biases include re-examining coded segments and interpreting categories in context, with the personas also participating in this phase of the study.

Data analysis. Before the data analysis, the data was imported into the NVivo and the followed-up source classification conducted. For data import, the videos, screen recordings and pictures previously transcribed with NVivo, so this stage there is no need to import them again. Thus, the documents of interviews and experience cards that were manually transcribed

in the Microsoft Office Word were imported into NVivo. Besides, for the persona-based SD method in this study, it is essential to classify all the sources according to different personas, which is extremely helpful in the next matrix coding query to compare personas' motivations. In this way, four types of multiple data files were imported into NVivo under each persona (Table 3).

In order to present the experiences of the four personas, focusing on transcribed textual data, coding is the core work of the analysis process. This work was also carried out in the software NVivo. To mitigate qualitative biases during data analysis, the analysis and interpretation process requires the researcher to move deeper and deeper into an understanding triangulation of multiple data sources, which is equivalent to peeling back the layers of an onion. Accordingly, it should be pointed out that in this process of interpretation, the researcher again returned to all data segments which have been assigned a particular code (Fig. 11). The process of interpreting the categories and subcategories in context is also a check on the findings. Additionally, the personas also participated in the data analysis phase of this study.

By drawing on the viewpoint of Saldan˜a (2013) that the qualitative analytic process is cyclical rather than linear, in this study, the coding methods are divided into two main sections: First Cycle coding processes and Second Cycle coding processes, with one hybrid method "First to Second Cycle coding processes" that lies in between them.

In the first cycle coding, to understand the motivation of different personas more comprehensively, 17 "parent" codes and 59 "child" codes related motivations of the four personas have also identified and coded line by line. Table 4 shows an excerpt from the Microsoft Office Excel spreadsheets exported from NVivo. Additionally, the code frequency of each persona was also presented (see Table 8 for a complete table).

During the after first cycle coding, in order to grasp the motivations of different personas, through the literature review of the characteristics of each role, the researcher conducted the preliminary classification according to the traits of the four personas. Finally, the classification process reorganized codes of personas' motivations and recommendations in the previous cycle and resulted in four categories with a total of 34 dimensions (Table 5).

Please Rate Your Emotion (Pre-visit)

Persona:

Services	Mark Your Experience	Notes
Online ticketing		
Traffic routes		
Guide map		
Panoramic for three main halls		
VR-Hall of Mental Cultivation (Yangxin dian)		
Applications (Apps)		

Please Rate Your Emotion (During-visit)

Persona:

Services	Mark Your Experience	Notes
From entrance to three main palaces		
Three main halls		
Hall of Mental Cultivation (Yangxin dian)		
Souvenir store		
Cafeteria		
Smart tour Apps		

Please Rate Your Emotion (Post-visit)

Persona:

Services	Mark Your Experience	Notes
Online-shopping		
Games		
Video & audio sources		

Fig. 7 Blank experience cards with selected touchpoints: pre-visit, during-visit and post-visit.

The second cycle coding is ways of synthesizing for reorganizing and reanalyzing data coded via previous cycles. During this session, the researcher adopted the Pattern Coding method in this coding cycle. According to Saldaña (2013), as a Second Cycle analytic process, the Pattern Coding method can develop category

labels and group many similar coded data to reduce the number of generated codes. That is, this process includes sorting and relabeling codes into a smaller number of conceptual categories. By drawing on the concept of the author, some conceptually similar codes combined; before combining categories, the



Fig. 8 On-Site observation: Service Safari and Shadowing (screenshot from recorded video).

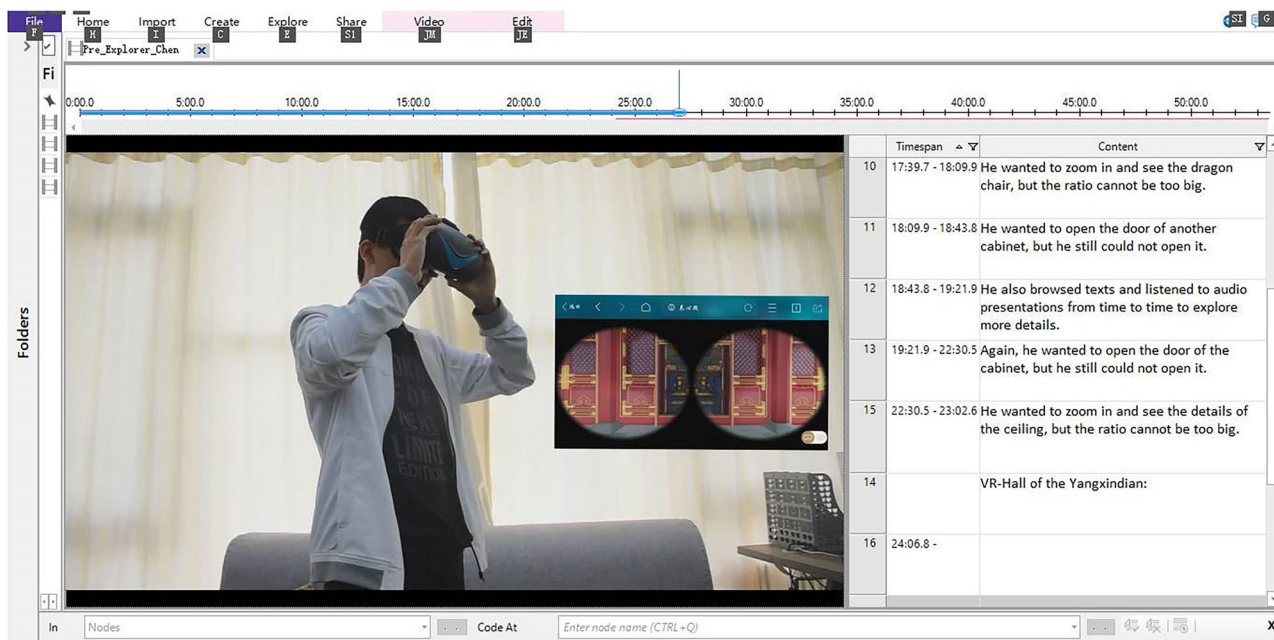


Fig. 9 Transcription of Videos and Screen Recordings in NVivo.

researcher often find more accurate words or phrases and then recorded some of the data; also, the researcher evaluated the role of less commonly used codes in overall coding, and then the redundant codes were removed (while the required ones were added). The above strategies used in the previous cycle too. To help in presenting the data, Table 6 summarized the reworked hierarchy for the four personas' motivations.

Finally, by synthesizing the experience options selected by the personas on the 12 experience cards utilized during three service stages, the following emotional curve was generated (Fig. 12). The current feelings of the four personas were indicated on each service touchpoint on the graph, for the researchers and museum UX designers to derive further useful information from it.

Findings: intrinsic motivations for different personas to visit museum

As Deci and Ryan (2012) proposed: "If someone engaged in an activity freely without being rewarded and found it highly interesting and enjoyable, the person would be intrinsically motivated." The following interpretation will explain their internal motivation through different personas. Through in-depth

analysis of roles, the study found that, although the dominant intrinsic motivations of the four characters are different, some intrinsic motivations are shared in many cases.

Explorer. This section mainly interpreted how Explorer's intrinsic motivation "Autonomy" reflected in physical and virtual visits of the Palace Museum. Through the analysis of the data, in the context of this study, the researcher gives this part a concrete theme: Discover and understand knowledge freely. Specifically, the theme was discussed from the following dimensions: Freely discovering uncertainty; Discovering internal details with curiosity; Knowledge-gathering by unlocking new areas; as well as Freely exploring and understanding.

As for the topic of discovering uncertainty, the Explorer proposes a game-like idea to design a route to explore and discover the mysteries. When referring to game design techniques, Explorer suggested that designers could use the mechanisms of finding treasures or exploring maps in games to enrich the museum experience. He further explained that for map design in games, there are only arrows without text hints. In other words, where the arrow guides the visitors is unknown, people will be

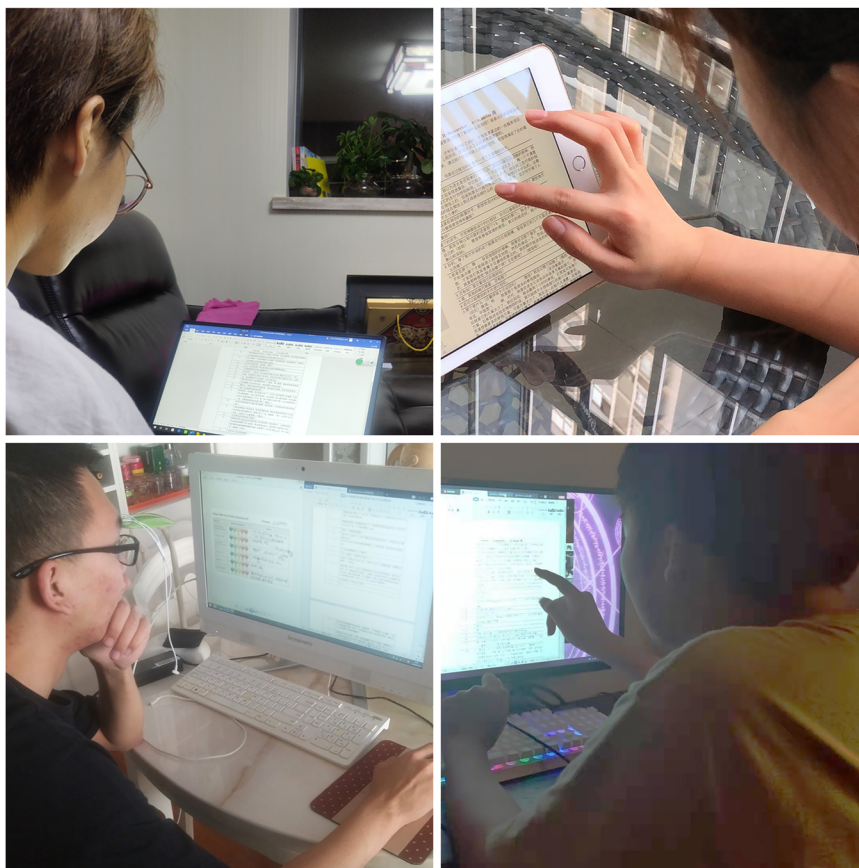


Fig. 10 Inviting personas to check transcriptions (member checking).

Table 3 Triangulation of multiple data files for each persona.	
Data Categories	Details
Three video transcripts	Video transcript in the pre-visit stage Video transcript in the during-visit stage Video transcript in the post-visit stage
Three interview transcripts	Textual interview transcript in the pre-visit stage Textual interview transcript in the during-visit stage Textual interview transcript in the post-visit stage
Three translated experience cards	Jottings on experience card in the pre-visit stage Jottings on experience card in the during-visit stage Jottings on experience card in the post-visit stage
Photographs	The persona took photographs

attracted by this mystery and then choose to explore the road of uncertainty. The real visit of the Palace Museum can learn from the game. Visitors are told the route, but unknown about what exist or happened through the route, which is exploratory. That fits the intrinsic visit motivation of the Explorer.

Then it comes to the motivation of discovering internal details with curiosity, and this section explained the discovery and exploration behaviors of the Explorer when visiting museums, such as discovering stories behind and exploring details. In the process of his safari and the researcher’s shadowing, the researcher always found that he always discovered stories behind and explore details with a curiosity. After he entered the Palace Museum, he did not pay much attention to the road underfoot but looked around. By shadowing him, the researcher found the Explorer curiously touched and looked down the stone pillars

and stone lions when passing by the bridge and steps, with his hand touching and photographing. The researcher also found him went around the back door of the Palace Museum and looked at the inside through the door slot, and he said, “This door is blocked entirely.” All of the observational evidence illustrates the motivation of the Explorer to discover the unknown and explore the details.

As triangulated evidence, Explorer was also interviewed. When asked how to make an exploratory player like him interested in the Palace Museum and continue to pay attention, he replied that it is the story behind the Palace Museum. As Explorer noted:

Then there are cabinets on both sides in the Taihe Hall. If follow the idea of the game (game mechanics), those cabinets can be open. But actually, these cabinets cannot be opened,

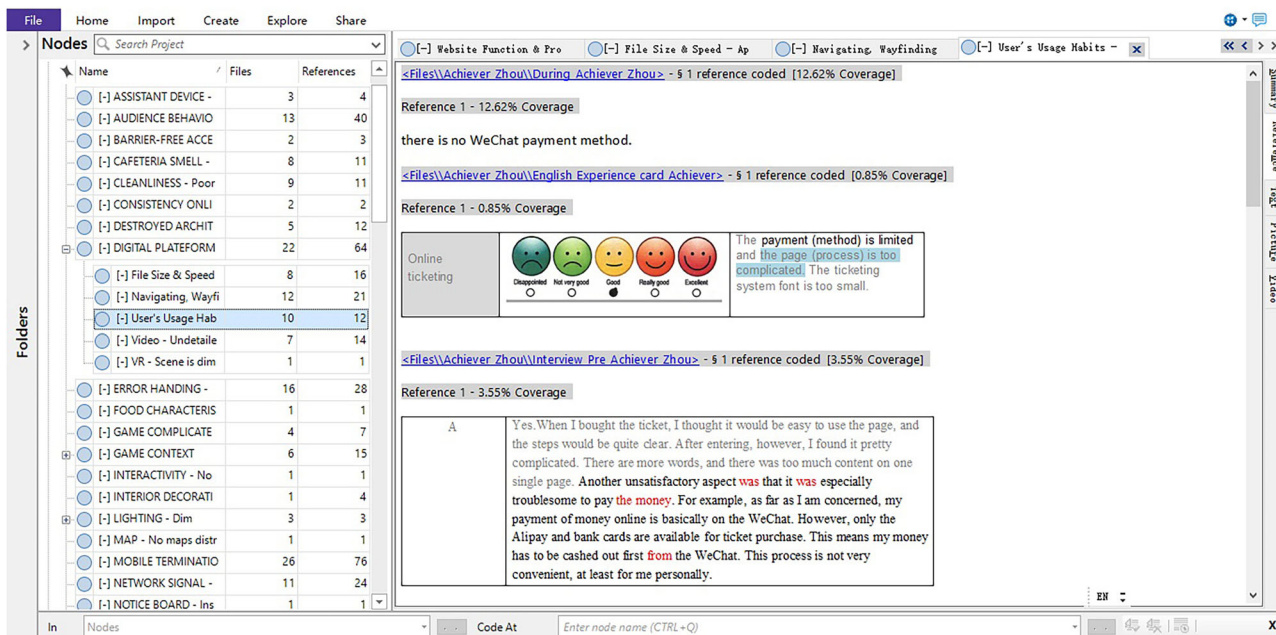


Fig. 11 Returning the data segments for the interpreting.

Table 4 An excerpt of the working list of 59 codes for motivations and recommendations.

Descriptions of Motivations and Recommendations	Achiever	Attacker	Explorer	Socializer
Alleviating Audience Congestion				
[REC] AUDIENCE 'FLOW-CONTROL'—Number of the audience inside the museum at the same time is controlled	0	0	1	0
[REC] MOTIVATION-RELATED ROUTES—Catering to visitors holding distinct motivations	0	0	1	0
[REC] POPULARIZING MORE ROUTES AND ATTRACTIONS—Introducing diverse paths, propagating more attractions	0	1	5	0
Completing Public Facilities				
[REC] SERVICE FACILITIES—Adding more barrier-free access (e.g., ramps, being convenient for the elderly and children)	0	0	0	3
[REC] TICKETING—Re-enabling ticket window	0	0	0	1

which makes people feel that they are very superficial. It will make people think what is inside of it. The more I look, the more I want to open it. – The Explorer (interview transcript)

In response to the above answer, he stated that there are just a few things that can be found online. In more in-depth interviews, the researcher found that the Explorer would love to have a guide to explain the story behind the exhibit or provide other forms of detailed instructions.

When it comes to knowledge-gathering by unlocking a new area, the Explorer mentioned he hope that the Palace Museum can repair and open more side houses so that there are more alternatives as well as more places to explore. It means that opening more places is to satisfy the desire to learn and explore.

Explorers also like exploring and understanding; that is, his exploration is not disturbed. For example, the researcher observed that he prefers to take sideways rather than main roads. The Explorer also emphasized in the interview that he prefers to search and observe by himself rather than hire a tour guide because it always makes him feel disturbed. This is not in conflict with the above mentioned that he hopes that someone explains for him; he just does not want to be noisy.

From the above analysis and interpretation of the data, the spirit of Exploration and Discovery are the main features of Explorers, and free discovery and understanding of knowledge is

the primary motivation. The visiting motivation of the Explorer mentioned above aligns with Nicholson’s perspective (2015), where he connected player types to the three categories of intrinsic needs in SDT (Self-Determination Theory). He associated the Explorer with the Autonomy aspect of SDT, concluding that Explorers enjoy exploring beyond the game’s limits, valuing variety, play, and the freedom to choose. At the same time, this finding closely resembles the characteristics of the Explorers type of museum visit motivation identified by Falk and Dierking (2013): visitors who are driven by curiosity, with a general interest in the museum’s content. They expect to discover something that captures their attention and fuels their curiosity and learning. However, Falk (2022) made a more insightful statement, he believes that the motivation for learning and education is inherent in museums, and therefore, it is more or less embedded in the other categories he proposed. In short, the findings show that Explorers seek discovery and learning, driven by curiosity and autonomy, both in gaming and museum visits.

Socializer. The motivations of Achiever summarized into two themes, Relatedness and Autonomy. This section firstly interpreted how Socializer’s intrinsic motivation “Relatedness” reflected in physical and virtual visits of the Palace Museum. Through contextual analysis of the data, the researcher gives this

Table 5 Working list of 4 categories with 34 dimensions for motivations and recommendations.

Categories	Dimensions
Exploratoriness & Discoveritory (Explorer)	DESIGNING GAME-LIKE ROUTE—Exploring and discovering mysteries DISCOVERABLE & EXPLORATORY BEHAVIORS—Discovering stories behind, exploring details OPENING MORE PALACES—Satisfying the desire to learn and explore EXPLORING WITHOUT BEING DISTURBED LUCKY TICKET—Combining online and offline PROVIDE LUCKY DRAWS—Winners get rewards (e.g., raincoats as rewards on rainy days)
Interactivity & Shareability (Socializer)	COLLABORATION—Museum should collect feedback from users INTERACTIVITY—Adding conversations and options to game and video SHAREABILITY—Distributed souvenir can share with others SHAREABILITY—Learning is to communicate with others TICKET—Converting e-ticket into paper ticket (for sharing) SOCIAL INTERACTION—A preference for the education simulation game COSPLAY—Wear ancient clothes SERVICE FACILITIES—Adding more barrier-free access (e.g., ramps, being convenient for the elderly and children) NEED MORE INSTRUCTORS—Helping to understand NEED MORE SERVICE STAFF—Being convenient for querying INTERACTIVITY—Providing answers after completing the online Q&A LEARNING NEW THINGS
Personality & Challengement (Attacker)	FREE SOUVENIRS—Museum distributes items to audiences DESIRE FOR PERSONALIZED GAMES DO NOT FOLLOW THE MAJORITY—Taking different routes, experiencing and challenging distinctiveness PK' MECHANISM OF GAME—Make a mechanism to PK with other players or another AI (artificial intelligence) FREE VISITOR DIVERSE PATHS PROVIDED—Better to not define the tour routes
Rewardableness (Achiever)	BOGO (Buy One Get One)—Ticket accumulation (e.g., redeem one free ticket with three tickets) GAME DESIGN IMPROVEMENT—Designing games with more rounds and reward mechanism APPS—Enabling collecting artifacts and achievements TICKET—Converting e-ticket into paper ticket (for sharing) SHAREABILITY—Sharing photos with friends SHARING IS PROPAGANDA COSPLAY WITH REWARDS- Taking group photos or playing games (with rewards) with cosplayers FREE SOUVENIRS—Museum distributes items to audiences ONLINE GAMES—To gain ticket discount, souvenirs, or something according to points and levels REDEEM TICKETS WITH COINS—Coins won by interacting with a museum (e.g., reading museum publications)

Table 6 A list of specific motivations for different personas to visit the museum.

Motivations in visiting museum	Intrinsic Motivations
Explorer Discovering uncertainty Discovering internal details with curiosity Knowledge-gathering by unlocking a new area Freely exploring and understanding	Intrinsic Motivation: Autonomy—Discover and understand knowledge freely
Socializer Cooperation and interaction Building connections with others Role-playing Exploring details Seeking knowledge	Intrinsic Motivation: Relatedness—Meet and engage with others, emphasize emotional relationships
Attacker Risk-taking, do not follow the majority Manipulative sensation	Intrinsic Motivation: Autonomy—Discover and understand knowledge freely Competence (Mastery)—Challenge and compete against others
Achiever Competitive accumulation	Intrinsic Motivation: Competence (Mastery)—Sense of accomplishment
Building connections with others	Intrinsic Motivation: Relatedness—Meet and engage with others, emphasize emotional relationships

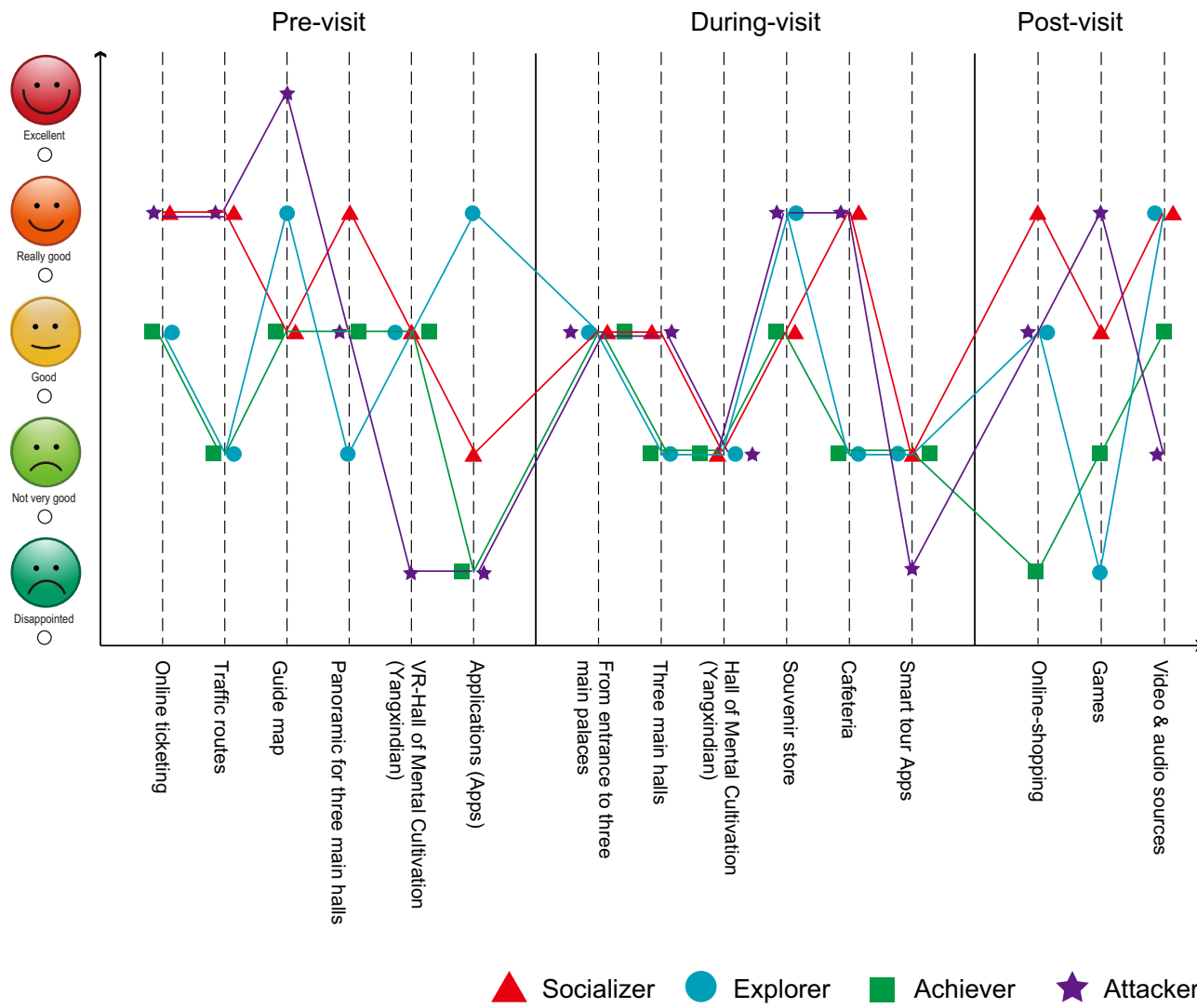


Fig. 12 Emotional curve based on 12 experience cards.

part a specific theme: Meet and engage with others, emphasize emotional relationships. Further, the topic discussed from the following dimensions: Cooperation and interaction; Building connections with others; Role-playing; and Exploring details. For Socializer, another theme explained already in the Explorer section, namely Autonomy—Discovery and understanding knowledge freely.

Relatedness. The following interpreted the Relatedness first. For the dimension of cooperation and interaction, Socializer firstly recommended the Palace Museum should collect feedback from users for the aim of collaboration. She expressed the Palace Museum should distribute some questionnaires to the audience or some small program can be developed for collecting feedbacks so that users can continuously get some of the new projects developed by the Museum. In this way, she will talk with friends around and will visit the museum if they are interested. In terms of games and videos, on the other hand, the Socializer proposed that add conversations and options in the game and video. In this way, the user can select an option in the pop-up dialogue frame, and the system will have different results according to various options of the user. In this case, the user choice enhances the extensibility of online content through interaction.

Socializer also expects to build connections with others, and she emphasized the importance of shareability in engaging with others. During the interview, she mentioned that distributed souvenir could share with others. She further explained the Palace Museum could distribute small souvenirs to take it back and share it with friends. If they like or want them, they will go to the Palace Museum to visit. Next, the Socializer expressed learning is to communicate with others. That is, discovering new things from the museum can help to share with others. Furthermore, it can be seen during the selection of the app that Socializer is more inclined to choose apps that have the function to interact with others. In her original words, it is similar to the educational simulation mechanism in the game to help players communicate.

The researcher also found that the Socializer is keen on Role-playing. It can also be seen from observations and interviews that Socializer prefer education simulation games. In further in-depth interviews, she also mentioned that she is interested in cosplay, so she like the “Try on” experience provided by the Palace Museum. It undoubtedly reflects the Socializer tendency to like interaction.

Similar to Explorers, the motivation of exploration details can also be found in Socializer. In interviews, the Socializer pointed out that more instructors are needed to help so that they will understand the cultural relics, and more service staffs are required for the convenience of audience. Although, the

above recommendations are discussing the lack of people, the intrinsic motivations reflected in discovering stories behind and exploring details.

Autonomy. For the Autonomy, as described in the part of the Explorer, the Socializer mainly shows the motivation of discovering and understanding knowledge freely during the visit. Specifically, in this investigation, the innate needs of Socializer are seeking knowledge. For example, on the experience card, she recorded there is no correct answer and explanation after answering the online question. In the interview, she also mentioned that she prefers to watch specific videos about the museum because they narrated it quite well, and she can also find a history that was not discovered before. She made it clear that she learned a lot of things and found a lot of new items.

The visiting motivation of the Socializer aligns with Nicholson's perspective (2015), associating Socializers with the Relatedness aspect of SDT, as they seek to meet and engage with others. However, an unexpected finding is that, in the museum context, both Socializers and Explorers share a common motivation, driven by museum exploration. This also resembles Falk and Dierking's Facilitators type (2013), where visitors are socially motivated, focusing on enabling the learning and experience of others in their group. In conclusion, the findings show that Socializers seek connection and engagement, driven by relatedness and autonomy, both in gaming and museum visits.

Attacker. This section mainly interpreted how the Attacker's intrinsic motivation "Competence (Mastery)" reflected in physical and virtual visits of the Palace Museum. Through the analysis of the data, in the context of this study, the researcher gives this motivation a particular theme: Challenge and compete against others. Specifically, the theme discussed the following dimensions: Risk-taking, do not follow the majority; and Manipulative sensation.

As for the motivation of the desire for risk-taking and do not follow the majority, he likes to play personalized games other people have not yet played, and hope that the museum will develop some special (unique) games. When choosing the game, the reason he mentioned was alternative or different. Maybe other people are afraid of the personality of the game name, but Attacker wants to challenge it. Also, in museum Attacker prefers to watch things of a minority. For example, he likes to see the unknown but precious stuff in the Palace Museum, and this motivation shared by the Explorer. For this, he said that if audiences want to go elsewhere to see what the royals have done in the past, visitors can choose a less popular path. He also suggested thinking of it is necessary to provide diverse guided paths on the spot. It was this disobedience that made him like challenges. As Attacker said, he hopes his points are the highest in the front; that is, he does not want to rank at an average level like the masses. This motivation is shared with the achiever.

When it comes to the motivation of manipulative sensation of the Attacker, he noted:

"I am going to carry out the single combat with a player in the game (Solo). I will first care whether I can beat this person before I decide whether to challenge him." – The Attacker (interview transcript)

The above mentioned explains the personality and challenge of the Attacker. When playing games, the Attacker must prepare to control the whole process, which is also applicable when visiting the Palace Museum. The Attacker hopes to learn a lot of information before going to the museum so that he will be more interested and feel well prepared to control the entire visiting process.

The visiting motivation of the Attacker aligns with Nicholson's perspective (2015), associating Attackers with the Competence (Mastery) aspect of SDT, as they seek competition and conquest. However, in the museum context, this study also finds that Attackers and Explorers share a common motivation, they are curious about the museum's unknowns. Overall, the findings reveal that Attackers are driven by competence, seeking challenge and competition, valuing uniqueness and control, exploring unknowns, both in gaming and museum visits.

Achiever. The motivations of Achiever summarized into two topics, Competence (Mastery) and Relatedness. The following will interpret the two themes in detail.

Competence. The following interpreted the Competence (Mastery) first, which is the sense of accomplishment. The sense of accomplishment on Achiever is mainly reflected in competitive accumulation that is, being powerful through points-gathering and rising in levels. For this issue, Achiever firstly proposed the games seem to be very systematic, and there is only such one round of settings. She recommended the game must have a design for more rounds, and then the player could accumulate a certain value such as points or coins. She also accidentally mentioned that, with this accumulation, one should rescue a person they want to help. From further interviews, the researcher found collecting artifacts and achievements made her proud, which attracted her most. For an instant, when discussing the app "Emperor for a Day" developed by the Palace Museum, Achiever mentioned:

"This is a game that allows you to understand the emperor's food & cloth, daily life, and work & entertainment. But what attracts me the most is that it can collect a lot of artifacts and impressive achievements. The more you collect in this game, and then you must be the one who is so powerful. This is more attractive to me." – The Achiever (interview transcript)

Relatedness. For the dimension of Relatedness, it discussed in the Socializer section. This motivation has also been found in the Achiever in the investigation. Specifically, the Achiever expects building connections with others. Since the Palace Museum uses online ticket sales, Achiever believes that the audience should be allowed to exchange e-tickets for paper ones. The reason for this is that many young people today like to use social platforms to share their photos, not only to keep in touch with friends but also to promote the museum as propaganda.

The visiting motivation of the Achiever aligns with Nicholson's (2015) perspective, associating Achievers with the Competence (Mastery) aspect of SDT. However, in the museum context, this study also finds that Achievers and Socializers share a common motivation, they value social connections within the museum. Meanwhile, Achievers and Attackers also share a common motivation: they take pride in their accomplishments. In summary, the findings reveal that Achievers are driven by competence, valuing social connections and taking pride in their accomplishments, both in gaming and museum visits.

Discussion and conclusion

In the context of the Palace Museum, the four personas exhibit distinct dominant intrinsic motivations: Explorers prioritize autonomy, driven by curiosity and the free discovery of knowledge; Socializers value relatedness, seeking engagement and connection with others; Attackers are motivated by competence, pursuing challenge and mastery; and Achievers focus on competence, emphasizing accomplishment and accumulation.

These findings corroborate both the Bartle taxonomy and Self-Determination Theory (SDT), supporting Nicholson's (2015) proposition that player types map onto intrinsic needs and are applicable beyond gaming, including museum visits.

Despite the distinct motivations, overlap exists among personas. Explorers and Socializers share a drive for museum exploration, reflecting a curiosity-based engagement with the museum environment. Socializers and Achievers both emphasize relatedness, valuing social connections within museum contexts, while Achievers and Attackers are motivated by accomplishment and mastery. Explorers and Attackers share a curiosity about the museum's unknowns. These overlaps align with Zichermann and Cunningham's (2011) assertion that players can simultaneously exhibit multiple motivational characteristics, and highlight the nuanced complexity of intrinsic motivation in heritage experiences.

Survey results further corroborate these overlapping motivations. Among 122 responses, personas were relatively balanced, with only a 10% gap between Socializers (highest) and Attackers (lowest), contrasting with gaps of up to 60% in prior studies (Zichermann & Cunningham, 2011). This indicates that shared motivations lead to a more even distribution, with Socializers as the largest group, consistent with Falk and Dierking's (2013) Facilitators, underscoring the central role of social engagement in museum visits.

The findings have several practical implications for museum design. To cater to Socializers, museums should prioritize interactive and socially engaging experiences, such as guided tours with group discussions, collaborative educational games, and opportunities for shareable experiences through themed photo spots or souvenirs. Explorers benefit from opportunities for autonomy, including hidden routes, unlockable spaces, and game-like mechanisms that encourage curiosity and independent discovery. Achievers are motivated by reward systems, progress tracking, and opportunities to collect artifacts or achievements. Although less numerous, Attackers offer insights into designing competitive and challenging experiences, such as alternative pathways, quizzes, or leaderboards that satisfy the desire for mastery and control.

In conclusion, gamification-based personas reveal both distinct and overlapping intrinsic motivations in museum contexts: autonomy for Explorers, relatedness for Socializers, accomplishment for Achievers, and challenge for Attackers. The convergence of qualitative data and survey data indicates that intrinsic motivations are not strictly segregated, suggesting that effective museum service design should leverage these shared motivations. A balanced approach should prioritize the majority while adding targeted elements for other groups, such as exploratory routes, achievement-based challenges, or competitive quizzes. These flexible, gamification-informed strategies meet diverse needs, promote inclusive participation, and gradually shift focus from external rewards to lasting intrinsic motivation.

Implications of the research

This study introduces an innovative approach to exploring museum service design, focusing on qualitative methods while considering the quantification of qualitative data. It addresses the gap in existing literature by demonstrating how Bartle's taxonomy of players can be utilized in the museum context and offers a reliable framework for future studies. The findings of this study, while focusing on the user experience of the Palace Museum, have broader implications for other historic house museums, particularly in China. Given that the brand experience of each museum is tied to its core values and each

museum's situation is unique, the Palace Museum represents a prominent example of a historic house museum. However, this type of museum shares certain similarities, particularly in the preservation and exhibition of ancient buildings, which are substantial cultural relics. Considering Beijing as an example, among the 151 museums listed in the directory, there are 40 ancient building cultural relics' protection institutions. As one of the most renowned historic house museums both in China and globally, the Palace Museum, Beijing offers valuable insights that can inform user experience research and provide practical guidelines for improving visitor engagement at other similar institutions. Therefore, the applicability of this research extends beyond the Palace Museum, highlighting the potential for its findings to benefit a wide range of historic house museums across the country.

Limitations and recommendations for future research

This study has several limitations that should be acknowledged.

First, in terms of sample breadth, the relatively small number of participants, while allowing for in-depth exploration of specific personas, limits the generalizability of the findings. The focus on young domestic visitors at the Palace Museum means that the results may not fully represent other demographic groups, such as older visitors or international tourists. Future research could therefore expand the participant pool to include a larger and more diverse set of users, enhancing the applicability of the findings across different museum contexts.

Second, in terms of methodological approach, although a preliminary questionnaire was used for participant recruitment, the core data relied primarily on qualitative methods such as service safari, shadowing, interviews, and experience cards. Such reliance may introduce researcher interpretation bias, as findings are shaped by observation and subjective coding. Future studies could therefore incorporate more robust quantitative validation alongside qualitative insights, enhancing the reliability and generalizability of the results.

Third, given the exploratory nature of this research, the conclusions remain context-specific and open to further development. Future studies should incorporate real-world testing and validation in multiple types of museums, including non-historic and international institutions, to examine whether the proposed improvements hold consistently across settings.

Finally, regarding the depth of insight, future research could recruit a broader and more diverse participant pool based on Bartle's taxonomy of player motivations. This approach would provide deeper and more nuanced understanding of visitor engagement, ensuring that museum enhancements effectively address varying interaction preferences across different cultural institutions and contexts.

Data availability

This study involves qualitative data containing personal information that could compromise participant confidentiality. Due to ethical restrictions and participant consent agreements, the full dataset cannot be shared publicly. However, anonymized excerpts pertinent to the analysis are available from the corresponding author upon reasonable request.

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Appendix

Appendix A

Table 7 122 results from 99 initial results by classifying the test results.

Respondents' Name (99 Respondents, 122 Results)	S (Socializer) %	E (Explorer) %	A (Achiever) %	At (Attacker) %
Socializers (37)				
CXY	87	67	47	0
GQ	80	53	13	53
YZH	80	47	20	53
ZHLY	80	67	40	13
NHX	73	33	53	40
WX	73	73	33	20
CHY	73	27	67	33
GJ	73	27	67	33
FCHW	73	67	27	33
ZHF	73	67	53	7
GXF	67	53	60	20
HLY	67	67	33	33
LJJ	67	60	27	47
SHXH	67	67	33	33
YYCH	67	47	67	20
ZHZHY	67	47	47	40
ZHML	67	60	27	47
WL	67	60	33	40
YXF	67	60	20	53
QR	63	40	53	53
GDD	60	47	40	53
LXZH	60	60	33	47
TJJ	60	60	47	33
WR	60	53	33	53
CYCH	60	33	60	47
WJ	60	40	60	47
XFT	60	27	53	60
MQ	60	40	53	47
WXY	60	47	60	33
YQL	60	53	60	27
GY	60	40	53	47
LXY	60	53	47	40
ZCHD	53	53	53	40
WJ	53	0	40	40
XLF	53	0	40	40
HTX	53	53	40	53
QYL	53	53	40	53
Explorers (33)				
CHHF	60	93	40	7
ANLJ	60	87	20	33
ZHBH	60	80	27	33
ZHZHL	67	80	13	40
WX	73	73	33	20
ZHL	47	73	47	33
YJF	47	73	53	27
YHCH	47	73	13	67
WJY	53	73	20	53
ZHMT	53	73	27	47
LZHT	47	73	33	47
CHYQ	40	67	33	60
HLY	67	67	33	33
SHXH	67	67	33	33
FXX	53	67	27	53
FXY	13	67	60	60
SZHS	60	67	40	40
QQL	53	67	40	40
QXY	60	67	40	33
TJJ	60	60	47	33
TT	47	60	53	40
YXY	33	60	53	53
ZHY	53	60	53	33

Table 7 (continued)

Respondents' Name (99 Respondents, 122 Results)	S (Socializer) %	E (Explorer) %	A (Achiever) %	At (Attacker) %
LXZH	60	60	33	47
SY	53	60	53	33
HAI	53	60	53	33
CHWT	40	60	40	60
WRX	40	60	40	60
ZCHD	53	53	53	40
ZHDT	0	53	33	40
LSQ	53	53	40	53
HTX	53	53	40	53
QYL	53	53	40	53
Achievers (28)				
ZHMW	33	40	80	47
CHNB	40	27	80	53
YSQ	33	27	73	67
XCHCH	33	27	73	67
LCH	40	40	67	53
YYCH	67	47	67	20
HYJ	53	53	67	27
KLY	47	53	67	40
YXM	40	47	67	47
ZJH	20	53	67	60
SHML	27	40	67	67
ZHQ	40	53	67	40
GJ	40	60	67	33
CHJH	60	53	67	20
SRQ	33	33	60	0
YJH	0	47	60	33
ZHK	53	53	60	33
CYCH	60	33	60	47
WJ	60	40	60	47
YGZH	47	33	60	60
WXY	60	47	60	33
RJW	27	53	60	60
YQL	60	53	60	27
XXJ	40	47	60	53
CHJH	40	47	60	53
ZHJK	40	47	60	53
QDC	40	47	60	53
ZCHD	53	53	53	40
Attackers (24)				
WHJ	53	20	40	87
HRL	53	20	47	80
YQ	20	40	60	80
LHY	13	60	47	80
LXZH	40	47	40	73
ZHZY	13	47	67	73
YSHW	40	40	47	73
ZHYSH	40	40	47	73
LYY	40	60	33	67
CHZHH	40	47	47	67
SHML	27	40	67	67
HXY	53	40	47	60
WYX	40	53	47	60
XFT	60	27	53	60
YGZH	47	33	60	60
HL	40	53	47	60
CHWT	40	60	40	60
ZHQ	40	53	47	60
WRX	40	60	40	60
RJW	27	53	60	60
CHHF	47	0	33	53
LSQ	53	53	40	53
HTX	53	53	40	53
QYL	53	53	40	53

Table 8 Working list of 59 codes for motivations and recommendations.

Descriptions of Motivations and Recommendations	Achiever	Attacker	Explorer	Socializer
Alleviating Audience Congestion				
[REC] AUDIENCE 'FLOW-CONTROL'—Number of audience inside the museum at the same time is controlled	0	0	1	0
[REC] MOTIVATION-RELATED ROUTES—Catering to visitors holding distinct motivations	0	0	1	0
[REC] POPULARIZING MORE ROUTES AND ATTRACTIONS—Introducing diverse paths, propagating more attractions	0	1	5	0
Completing Public Facilities				
[REC] SERVICE FACILITIES—Adding more barrier-free access (e.g., ramps, being convenient for the elderly and children)	0	0	0	3
[REC] TICKETING—Re-enabling ticket window	0	0	0	1
Ensuring Enough Service Staff				
[REC] NEED MORE INSTRUCTORS—Helping understanding	0	0	0	1
[REC] NEED MORE SERVICE STAFF—Being convenient for querying	0	0	0	1
Exploratoriness & Discoveritory				
[REC] DESIGNING GAME-LIKE ROUTE—Exploring and discovering mysteries	0	0	2	0
[REC] DISCOVERABLE & EXPLORATORY BEHAVIORS—Discovering stories behind, exploring details	0	0	10	0
[REC] LEARNING NEW THINGS	0	0	0	1
[REC] OPENING MORE PALACES—Satisfying the desire to learn and explore	0	0	1	0
Improving online Shopping				
[REC] ONLINE TICKETING—Simplifying unnecessary operations	0	0	1	0
[REC] OPTIMIZING SHOPPING—Being in line with user habits	0	0	0	1
Interactivity & Shareability				
[REC] COLLABORATION—Museum should collect feedbacks from users	0	0	0	2
148 : [REC] INTERACTIVITY—Adding conversations and options to game and video	0	0	0	1
[REC] INTERACTIVITY—Providing answers after completing the online Q&A	0	0	0	1
[REC] SHAREABILITY—Distributed souvenir can share with others	0	0	0	2
[REC] SHAREABILITY—Learning is to communicate with others	0	0	0	2
[REC] SHAREABILITY—Sharing experiences with others	0	0	0	15
[REC] SHAREABILITY—Sharing photos with friends	1	0	0	0
[REC] SHARING IS PROPAGANDA	1	0	0	0
[REC] SOCIAL INTERACTION—A preference for the education simulation game	0	0	1	2
[REC] TICKET—Converting e-ticket into paper ticket (for sharing)	3	0	0	0
Optimizing Mobile Termination Compatibility				
[REC] MOBILE TERMINATION—Optimizing compatibility	0	1	1	2
[REC] OPTIMIZING GAME COMPATIBILITY	0	1	0	0
Optimizing Network Signal				
[REC] OPTIMIZING NETWORK SIGNAL	0	0	0	1
Optimizing Signboards				
[REC] INTRODUCTION—Providing voice introduction, or big QR codes to scan for exhibits introduction	1	0	0	0
[REC] OPTIMIZE SIGNBOARD—Location, content, form, clarity, etc.	0	0	3	1
Perceiving Interior from Outside				
[REC] RICH PRESENTATION—Introducing image display, telescope, and comment	2	0	0	1
[REC] UNOPENED AREAS—Interior images and videos should be provided	1	0	0	2
Personality & Challengement				
[REC] DESIRE FOR PERSONALIZED GAMES	0	1	0	0
[REC] DO NOT FOLLOW THE MAJORITY—Taking different routes, experiencing and challenging distinctiveness	0	9	0	0
[REC] 'PK' MECHANISM OF GAME—Make a mechanism to PK with other players or another AI (artificial intelligence)	0	2	0	0
Providing Timely Information				
[REC] DYNAMIC ROUTE AND MAP—Providing traffic routes and tour map according to time periods of day	0	1	0	0
[REC] INFORMATION UPDATE—Timely update the latest related to museum	1	0	3	0
[REC] ONLINE INFORMATION—Providing more information online to stimulate on-site visits	0	2	0	0
Recommendations for Derivatives				
[REC] OPTIMIZE APP AND FAST DOWNLOAD	0	0	1	0
[REC] SOUVENIR—Launching more	0	1	0	0
[REC] SOUVENIR—Too delicate may let people enshrine them instead of using them	0	0	1	0
[REC] SOUVENIR DESIGN CONCEPTS—Design concept should be shown	0	1	0	0
[REC] TARGET PLAYER—Developing some easy games (reconsidering expertise of game players)	1	1	0	0
Relevanceness & Consistency				
[REC] CONSISTENCY—Online images are closer to reality	1	0	0	0
[REC] RELATIONSHIP—Entity itself is vivid than the online	0	1	0	4
[REC] RELATIONSHIP—Lucky ticket combine online and offline	0	0	2	0
[REC] RELATIONSHIP—Virtual tour cannot replace on-site visits	0	0	1	0
[REC] STYLE CONSISTENCY—Rather than formal uniform, staffs may wear ancient costumes that originated from palace	1	0	0	0

Table 8 (continued)

Descriptions of Motivations and Recommendations	Achiever	Attacker	Explorer	Socializer
Rewardableness				
[REC] APPS—Enabling collecting artifacts and achievements	1	0	0	0
[REC] BOGO (Buy One Get One)—Ticket accumulation (e.g., redeem one free ticket with three tickets)	0	1	0	0
190 : [REC] COSPLAY WITH REWARDS- Taking group photos or playing games (with rewards) with cosplayers	2	0	0	0
[REC] FREE SOUVENIRS—Museum distribute items to audiences	1	0	0	1
[REC] GAME DESIGN IMPROVEMENT—Designing games with more rounds and reward mechanism	5	0	0	0
[REC] LUCKY TICKET—Combining online and offline	0	0	2	0
[REC] ONLINE GAMES—To gain ticket discount, souvenirs, or something according to points and levels	10	0	0	0
[REC] PROVIDE LUCKY DRAWS—Winners get rewards (e.g., raincoats as rewards on rainy days)	0	0	1	0
[REC] REDEEM TICKETS WITH COINS—Coins won by interacting with museum (e.g., reading museum publications)	1	0	0	0
Self-service Tour				
[REC] EXPLORING WITHOUT BEING DISTURBED	0	0	4	0
[REC] FREE VISIT OR DIVERSE PATHS PROVIDED—Better to not define the tour routes	0	2	0	0
Youth's Preferences				
[REC] AMUSINGNESS & IMMERSIVENESS—Adding interesting elements and drawing on third-person perspective	3	0	0	0
[REC] PRODUCTS PREFERENCES—Being interested in cosmetics and products with retro style	0	0	0	6
[REC] YOUTH'S PREFERENCES—Video, anime, game, and VR	0	0	0	3

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Author contributions

Conceptualization, SL, MZI, and CX; methodology, SL and MZI; software, CX; investigation, SL and CX; resources, CX; data curation, CX and SL; writing—original draft preparation, SL; writing—review and editing, SL, CX and MZI; visualization, SL. All authors have read and agreed to the published version of the manuscript.

Competing interests

The authors declare no competing interests.

Ethical approval

Ethics approval for this study, “Exploring the motivations of young museum users through identifying personas based on Bartle’s taxonomy of players,” was obtained from the Department of Science and Technology, North China Institute of Aerospace Engineering (Approval number: 20211111; Date: 11 November 2021). All procedures were conducted in accordance with the principles of the Declaration of Helsinki and relevant national research ethics regulations. To ensure the rigor of this multi-year project, a pilot phase was conducted in 2020 to finalize the research protocols required for the formal ethics application. However, the subsequent institutional approval process encountered administrative delays due to the COVID-19 pandemic, which postponed the formal issuance of the clearance until late 2021. We clarify that the formal research phase and primary data analysis were conducted strictly after this official ethical clearance was granted.

Informed consent

Informed consent was obtained in writing from all participants. For the pilot phase conducted in 2020, informed consent was secured from the four participants prior to their involvement to ensure ethical conduct during the exploratory stage. For all subsequent participants in the formal study, informed consent was obtained following the receipt of the institutional ethical approval. All respondents were fully informed about the study’s purpose, methods (including behavioral observation, interviews, and questionnaires), and the planned use of data (e.g., in theses, conference presentations, and publications). They were assured of full anonymity and advised regarding the recording of video, audio, or photographs.

Additional information

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