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Graphic Guide System And Evaluation Model Based On User Experience

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Abstract: The design of a graphic guidance system based on a people-oriented and user experience perspective is a new research field. The UX (User Experience) approach to design the guidance system is a combination of the five elements of UX by Garrett. This study explains the related UX problems in the graphic guide system design and tries to find the best solution to design the system laws. Questions: This study mainly explores two aspects. First, create a theoretical framework of the graphic guide system from the perspective of UX. Secondly, build a guide system evaluation model based on UX. Methodology: 1. Develop a theoretical framework for a guidance system dominated by UX using theoretical research and review methods. 2. Using the AHP (the Analytic Hierarchy Process) method and combining it with Nanning public transport station case study, the priority levels of the guidance system are arranged first from the five levels of UX. Then the AHP method is used to standardize the evaluation data of the five-layer frame. Subsequently, the priority weight of 19 index layers of the five decision-making levels is sorted, and the results are obtained. Finally, it summarizes the excellent graphic guide system design and evaluation model system centered on UX. It provides a reference for scientific and accurate methods and ideas for future graphic guide system design and evaluation.

Keywords: graphic guide system, UX, emotional design, wayfinding, AHP

Introduction

The oriented sign system based on user experience is to design a good interaction mechanism between users, environment, and oriented sign system to realize the good operation of the oriented sign system. In the past, the research on the graphic guidance system was divided mainly into research based on the urban space environment and the research based on a certain type of specific public places such as subways, shopping malls, and theme venues. The design purpose of the guidance system is to create an orderly space environment for users. It has two meanings: one is the spatial shape of the guide carrier, and the other is the positioning and guidance of the perspective space. The generalized spatial guide content can use the five elements of urban imagery proposed by Kevin Lynch in The Image of The City: node, landmark, edge, path and district to understand the division of space. The narrow sense of navigation system design content refers to a unified whole composed of texts, graphics, colors, or other information guiding media in a certain space. Among them, the graphic guidance system embodies the superior nature of semiotics. Through "icon," "index," and "symbol" plays an irreplaceable value in the entire guidance system. In the book The Wayfinding Handbook, Gibson (2009) pointed out that a guidance system is a set of guidance systems formed through icons, colors, symbols, and texts to solve the problem of users finding directions and paths in a specific environment. The guiding graphics early were used in the transportation system. In 1909, Europe appeared the world's first set of uniform international standard traffic signs. Until the 1930s, a relatively scientific and accurate visual communication system had been applied to the public by a few developed countries. The distribution map of the London Underground system designed by British designer Henry C. Baker laid the foundation for the visual-oriented design of modern transport.

Until the 1980s, ISO (International Organization for Standardization in Geneva) released a visual guide graphic symbology that applies to the world. At present, the research on the navigation system is divided mainly into several aspects. The first aspect is starting from the environmental space to study the relationship between the navigation information and the environment. The research in this aspect is mainly for specific places such as subways, museums,

exhibition halls, hospitals, shopping malls, and other public environmental spaces; The second aspect is to explore the application of new technologies and new forms in the guidance system. This aspect of research mainly focuses on electronic technology such as mobile navigation APP, electronic maps, navigation equipment, etc. They are new technologies and research on new guide devices for special populations such as the visually and intellectually impaired. The third aspect starts from the guiding form, exploring the role of human vision, hearing, touch, and smell in identifying directions and paths. Among them, vision-oriented exploration is the most extensive. According to Rudolf Arnheim (1954), human visuals account for about 70% of the information collected. This research belongs to the category of visual art, which mainly explores the visual design of graphic symbols in the guidance system from the user experience perspective. However, graphic symbols play an important role in the guidance system. They can improve the visual recognition of the guidance information, activating the space atmosphere, and the value of thinking and memory are closely related. No matter what kind of research is to provide people with better navigation services, focusing on the design of the navigation system from the perspective of user experience can better reflect people-oriented design thinking. It's generally believed that Donald Norman proposed and promoted the concept of user experience in the early 1990s. With the rapid development of information technology and internet products, its connotation and framework continue to expand, involving more fields, such as psychology, Human-computer interaction and usability testing, which have been incorporated into the related fields of user experience. Different scholars have begun to try to interpret user experience differently from different angles. Among them, Lucas Daniel's (2000) definition of user experience is representative: the user is operating or what you do, think, and feel when using a product or service involves the rational value and perceptual experience provided to users through the product and service. Although user experience has only been widely concerned in the internet era, it is fundamentally focused on the relationship between people and the object being acted upon. For this reason, Frederick Winslow Taylor, known as the father of scientific management, has the research and exploration to improve the efficiency of human-machine interaction and is considered the pioneer of user experience today. Ergonomics, which was developed in the 1950s and focused on safety and physiological comfort, is the early user experience research in the field of product

design. Designing for People, published by Henry Dreyfuss in 1955, is well-known in this field. Representative works, with the continuous development of ergonomics, human factors engineering with broader connotation has gradually emphasized safety, comfort, psychological feelings, usage scenarios, cultural backgrounds, and social contexts, from individuals to groups, from physiology to emotions and other comprehensive factors. In the 1980s, user-centered design concepts emerged. A group of new design consulting companies represented by Fitch and comprehensive universities represented by Carnegie Mellon University also proposed and advocated "useful, easy-to-use, attractive" design principles that have greatly promoted the development of user experience research. Pine ll and Gilmore (1999) emphasized that under the background of increasing homogeneity of products and services, companies use products as props and services as stages of creating personalized experiences for consumers and forming new differentiated competitive advantages. The experience here is no longer the feeling of using the product or service but the event generated by different individuals in the interaction process. The experience has also become a new form of commodity independent of the department store goods and services. The user experience is the user using the product or enjoys the purely subjective feelings established during the service.

The graphic guide system is a public service facility set up in the space environment to help people recognize, understand and use the space in the environment. As a facility system that helped users obtain environmental information and find directions in the environment, the use process of the graphic guide system is a "self-service" mode of use. There is no pre-read instruction manual to guide users on using it, and users can rely on only one's own knowledge and experience. It can be seen that starting from what the user wants and needs, paying attention to user experience has important strategic significance for the design of the navigation system. With the increase in the complexity of the environment, the design of the navigation system is becoming more complicated. The design elements of the navigation system are re-analyzed and defined. The user experience problem is decomposed into several components, which is beneficial to analyze better and solve user experience problems. In the book User Experience Elements, Garrett (2010) decomposes user experience issues into five levels: strategy, scope, structure, skeleton, and surface. As an information service system, the graphic guide system is the key to its user experience design is to

provide users with a combination of information that is easy to find, identify and understand. The design process can be based on the five levels of Garrett (2010) to analyze and think about user experience issues. In order to find the best guide-view solution. From the perspective of user experience, we put forward and construct the theory and solution of optimized graphic guide system design. On this basis, combined with the three theoretical levels of Emotional Design proposed by Norman (2004), it rises to the level of designing pleasant service products. In the end, the entire navigation system will be unified and complete, with clear and effective guidance and an environmental guide service system with a pleasant and active atmosphere. This research is also the designer's continuous innovation of thinking and reflecting the design needs of the "people-oriented era." Although researchers have proposed methods and principles for the design of the guidance system from various aspects, how to judge whether the guidance system meets the needs of users and whether it accurately realizes its effectiveness and aesthetic value, the current guidance system evaluation model based on user experience remains to be development and research.

Literature Review

In the Paleolithic Age, humans used symbolic signs as communication and the recording of ideas. Humans used different methods to convey information, mainly in the form of markings and knots on stones and trees, ropes, marking roads, etc. These simple and clear primitive symbolic figures help people find their way and promote the formation of a guidance system. SIotype was born in the modernist graphic design movement in the 1920s. It is a graphic transmission system. Through the combination of visual symbols and numbers and charts to explain complex economic and social issues to the public, the SIotype has achieved a good guiding effect. "Way-finding" was first proposed by Passini (1984), who believed that way-finding is a person's ability to solve spatial problems based on three dimensions: decision-making, decision-making execution and information processing. The execution of pathfinding decisions requires environmental information, especially symbols that describe the location. When the decision to reach the destination is generated cognitively, the decision execution process disassembles a complete decision task into several subtasks. The disassembled subtasks in the pathfinding decision correspond to

the settings and positions of the guidance information. The corresponding decision-making execution of each sub-task requires the guide at the corresponding position to provide sufficient visual information to assist the decision-making in preventing the pathfinder from getting lost. Kevin Lynch (1960) believes that people's pathfinding ability comes from the coherence and organization formed by a clear sense of the external environment, and this "clear feeling" is established by way-finders through the relevance of a large amount of information. From the perspective of modern city research, LIU Dan (2019) studied the relationship between the guide system and urban space. She analyzed the operation mode of the graphic guide system from different dimensions of urban space. She pointed out that the guide system is the best way to divide the urban spatial structure. Most intuitively, the role of the guide system in urban space is, in the final analysis, the role of the human subject. The modern city's space was more than just a material concept; it was a dialectically unified humanistic concept of materiality, sociality, and history. As the guiding part of urban space, the guide system is a frame of reference for urban space and an important spatial configuration. Zang Yong (2014) emphasized that identification occupies an extremely important position in the guidance system of public space. The audience's psychological response and behavior use scientifically set colors, reasonably selected materials, and accurately corrected text. Uniform specifications make the system easy to read and identify, combining practicality and art. Liu Yu (2014) proposed that in different environments, the guidance system should combine the unified changes of the environment and integrate with the architecture to give an artistic atmosphere. The guide system design follows the background of regional culture and natural environment to determine the rational relationship between the design starting point and the design form, thereby improving Guide the efficiency of the system while disseminating optimized information and design aesthetics. Combined with the environmental space, the research on the navigation system focuses on the relationship between the navigation system and the environment. It relatively lacks attention to the feelings and experiences of people as users. Smitshuijzen (2007) comprehensively discusses the steps of guidance system design in the Signage Design Manual: First, determine the scope of work and organize relevant people. Secondly, design the guidance system and produce the text. Third, create a visual image. Fourth, detailed manufacturing and installation matters, including

supervision. Fifth, update and maintain the organization logo. Emphasize that the user is recommended to participate in design decisions from the first step. The book points out that the entire guide design process should follow the relationship between users, environments. The book is rich in illustrations, but it doesn't contain a sample of an actual guide project, but other books about signs fill this gap. For example, the book Sign Graphics edited by Serrats (2006) includes three parts: personalization of logos, internal icons, and graphic advertisements in the city. It uses vision to study the iconic products that appear in our daily lives. The book Signage Design Courses by Xiao Yong and Cui Fangjian (2010) organizes and analyzes the guide system's concept, composition, design method, and excellent cases; Dopress Books (2012) edits New Direction: new wayfinding & signage system in the world. The latest guide and sign design works of 50 famous studios or design companies, and detailed interpretation of the design concept of each case. The scope of works covers indoor and outdoor spaces in various public environments such as museums, stadiums, airports, schools, hospitals, clinics, urban transportation, parking lots, parks, corporate office buildings, etc. World Wayfinding System Design by Moore (2016) collects the best global project design plans in the field of guide design and shows readers the most advanced guide design projects from all over the world, which are divided into parks, educational facilities, commercial spaces, hotels, transportation, medical care, etc. Andreas Uebele (2008) discussed the styling elements of the Guidance System Design, the planning and process of the design project and design cases. The author believes that the guidance system is not just a simple information sign; it can give a clear image of the building's positioning. With the careful creation of the designer, numbers, symbols and words can all add color to the building. He proposed that the guidance system should be treated as carefully as choosing a light switch or a door handle. It is a vital detail in architectural design. These individual individuals constitute a complete form of the whole. This also sets the theoretical groundwork for future academics to explore the guiding system's design from the viewpoint of the environment and the specific space. Wang Yixiang (2008) also mentioned that environmental visual design could serve as a bridge for information transmission and communication in a complex space environment. The purpose of setting up flat or three-dimensional decorative signs in the environment is to use special shapes to establish the visual image of the building. After perceptual organization and construction, an easy-to-understand

whole is formed in human cognition. The guidance system is a visual design that exists in space and is combined into visual information within the scope of human vision. Through perceptual reprocessing of visual information, humans can quickly obtain information in a complex space environment. Gestalt theory states that visual perception organizes and simplifies the information it sees to produce an easy-to-understand whole. As a plane figure in space, the guidance system exists as a system as a whole and as many monomers that are understood and recognized by perception as a whole. There are still many theories and cases exploring the design of the navigation system from the perspective of the relationship between the navigation system and the environmental space. But the main research aspects have been mentioned above.

Pine II & Gilmore (2011) pointed out in The Experience Economy that the future economic development belongs to the experience economy era. The experience economy pursues the satisfaction of users' positive self-feelings and emphasizes the self-experience of users in the consumption process. The main characteristics are sensory, personalization, and participation. The user's demand for products is no longer limited to functional satisfaction, and more attention is paid to the psychological needs of users. Norman (2004) pointed out that a successful user experience must first meet the customer needs without harassing or annoying users; secondly, the products provided should be simple and elegant so that customers can use them happily and bring additional surprises to users. As user experience continues to expand in content and architecture, the meaning of user experience is also expanding (Scapin et al., 2012). In recent years, research fields closely related to users, such as usability, user-centered design, perceptual engineering, interactive experience, and emotional design, have all involved some aspects of user experience. Still, the true meaning and specific content of user experience and the evaluation method have not formed a consensus. Hassenzahl and Tractinsky (2006) define user experience as the user's inner condition (tendency, expectation, demand, motivation, mood, etc.) and the system with specific characteristics (complexity, purpose, usability, functionality, etc.) in a specific interactive environment. Literature research shows that most of the literature in user experience research does not divide the user experience composition according to one of the above theories but selects the user experience components based on actual research questions. For example, Hassenzahl (2008) believes that user experience includes four aspects:

operability, recognition, motivation and revelation, and divides the composition of user experience into practical and hedonistic ways; Morville (2004) divides user experience into usability, usefulness, and ease of use. The user experience is evaluated in seven aspects: reliability, reliability, ease of search, desirability, and value. This division is similar to Hassenzahl's research; Roto (2006) summarizes the components of user experience as wow, functionality, and usability (flow) and pride (show). Garrett (2010) breaks down the user experience problem into five levels: strategy, scope, structure, skeleton, and surface. In terms of user emotional experience research, Norman (2007) points out the three levels of emotional experience that product design should satisfy from the perspective of emotional design: visceral, behavioral and reflective. The emotional design aims to integrate the user's emotional needs into design elements and find out the product design elements that affect the user's emotional satisfaction by establishing the relationship between the user's subjective emotional feelings and the perceived design elements (Jiao et al., 2006). Park et al. (2013) pointed out that user experience includes usability, emotion, and user value. User value mainly includes self-satisfaction, pleasure, personalized needs, social representation, and product additional meaning. From the perspective of user experience, exploring the design of navigation systems is a relatively new research field that has only appeared in the last few years. Norman (2007) believes that good design elements and scientific guidance classification are the basis of a good guidance system, combining the audience's visual psychology and behavior characteristics (Shengli & Min (2009). The user experience in the oriented sign system service is the result of the interaction between the user and the environment or the user and the oriented sign system and is affected by various internal factors such as the user's different motivations, existing experience, and cognitive differences. Therefore, the determination of user objects needs to be analyzed in conjunction with the characteristics of the target environment, and further user group segmentation is performed based on user attribute factors, and user needs analysis is promoted by establishing user models. Ergonomics theory and cognitive psychology theories design the ways of presenting information, create the unique charm of subway stations, and establish the emotional connection between users and the city and space. Miller (2015) believes that the aesthetics that need to be added to the design of the guidance system are not the same as the aesthetics of artistic works. Public design needs to

use the most effective methods to meet people's needs. In the guidance system design, all visual elements should play an active role in transmitting effective information and should use cognitive “grammar” and reasonable “coding.” In The Practitioner's Guide to User Experience Design, he proposed five elements of super-expected user experience: Learnability, Efficiency, Memorability, Errors, Satisfaction. Yulian He (2017) believes that the design of an oriented sign system based on user experience is to design a good interaction mechanism between the user, the environment, and the oriented sign system to realize the good operation of the oriented sign system.

Today’s urbanization process is in full swing, and the relationship between people and the city space has become an important design issue. No matter where you are in any space, you will inevitably have frequent contact with the design of the space and the guidance system and complete specific occasions accordingly. As for the activities and emotional experience, this requires the functionality of the guidance system and the uniqueness of visual expression aesthetics. This determines that our design must comprehensively consider, handle, and have the integrity of function and visual beauty in dealing with functions, spatial relationships, and visual beauty to truly be people-oriented and reshape the guidance system and space of the current era. This research is based on the cross integration of the five levels of user experience (Strategy, Scope, Structure, Skeleton, and Surface) and the three levels of emotional design (Visceral, Behavioral and Reflective). Construct a design theory for guiding the visual system from user experience to emotional pleasure.

Graphic guide system for UX

Garrett (2010) proposed the five levels of user experience elements and the corresponding content of the navigation system, as shown in Figure 1.

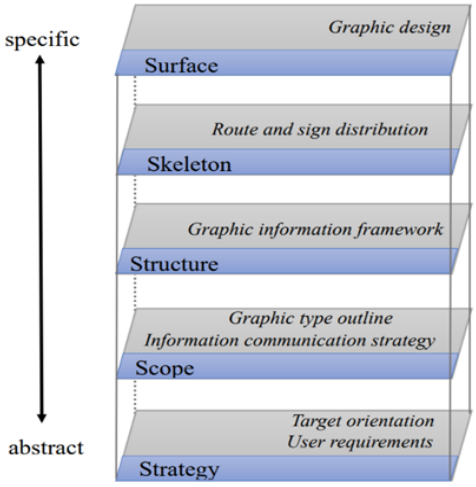

Figure 1： Five user experience elements in the design of graphic guide system

At the strategic level, the guidance system needs to solve two problems: the first is who provides guidance services, and the second is what users expect the guidance system to solve. For example, the subway station guide faces the general public, especially those who are not familiar with the site environment. The needs of commuters and internal employees who take the subway for a long time to get off work can be ignored. Therefore, the determination of user objects should be analyzed in combination with the characteristics of the target environment, and the user group should be subdivided according to different attribute factors. At the scope level, it is necessary to establish an information communication strategy that guides the design of the sign system and sets an outline of the sign type. The design of the guidance system needs to determine the corresponding information transmission strategy according to the cognitive characteristics and different needs of different user groups. Human wayfinding is a process of continuous interaction with the environment. Some people can judge the path directly, some need visual aids, some need auditory information or tactile information (for the visually impaired), and some are used to using maps or navigation APP, etc. Therefore, the guidance system should integrate multiple strategies such as target orientation guidance, path guidance, area division, and landmark setting to meet the needs of different user groups. At the structural level, after clarifying the information transmission strategy and determining the

guidance information type outline, it is necessary to organize the content of the outlined information in an orderly structure to provide users with orderly and continuous guidance information. At this level, information needs to be hierarchically designed. Level 1 information provides users with the overall layout and overview of the environment. For example, important and in-demand oriented information (ticket hall, waiting hall, etc.): the second-level information label refers to the comprehensive regional information content that provides users with more details within the first-level information. For example, the waiting hall may be divided into several small areas such as waiting areas, shopping areas, and living service areas. Level 3 information is the most basic level of information, which refers to the most direct and specific target location information—for example, the specific number of trains waiting in which area. The three levels of information cooperate to construct a coherent and compact guidance information system. At the framework level, the main focus is on independent components and their relationships. Forming an inherently smooth linear navigation requires a scientific, reasonable and humanized spatial location and planning of independent guidance identification information at this level. At this level, two problems need to be solved: 1. Preset the travel route according to the characteristics of user activity trajectories and information requirements, analyze the path trajectory, plan and organize passenger flow, and provide users with fast and effective guidance information. 2. Mark nodes on the user's activity path, clarify each sign's location, scale, installation method, viewing direction, information content, etc. The design content of the frame layer expresses the information architecture of the entire system with a layout map of the guide information, presenting a detailed position of the individual signs in the space and the internal logic between the individual entities. The presentation layer design is to guide the visual system to be presented to the user in the most intuitive way of visual presentation. It is the part that is easiest for the user to perceive and experience. The user obtains the required information through each visual identification content. How to let users get a good experience through the presentation layer? You can use Norman (2007) to propose three levels of user experience (instinct level, behavior level, reflection level) for comprehensive analysis and consideration. First, the user draws the user's attention through various forms of perception, such as vision, hearing, and touch, to achieve an instinctive experience. Users can obtain convenient and effective services to

realize the action-level experiences by obtaining the natural and smooth information of the guide logo, the clear and clear information content, the reasonable layout of the information layout, the coherence of the guide information, and the smooth guidance. Based on the first two, the overall quality presented by the guide marking point to the face information to the entire guide system stimulates users' deep-level experience in emotion, consciousness, understanding, experience and cultural background. Realize the user's reflective experience, as shown in Figure 2.

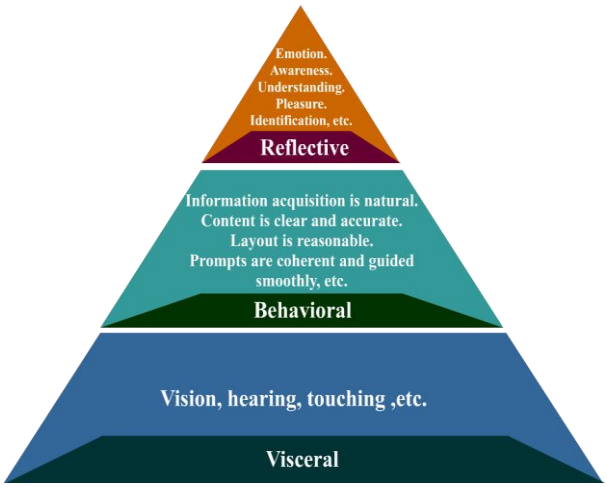

Figure 2： The level of emotional experience corresponding to the guidance system

User evaluation method of graphic guidance system based on UX

The analytical method of the Analytical Hierarchy Process proposed (AHP) by Thomas L. Saaty (1984) is mainly used to deal with complex multi-criteria index decision-making problems. To achieve the set goals through research, determine the relative priority of different standard factors. Firstly, according to the five-level model of user experience, the guiding system is divided into five design principles from abstract to concrete: target orientation, graphic type outline, graphic information framework, route and sign distribution, graphic design. The decision hierarchy model of the guidance system is built by the AHP method, as shown in Figure 3.

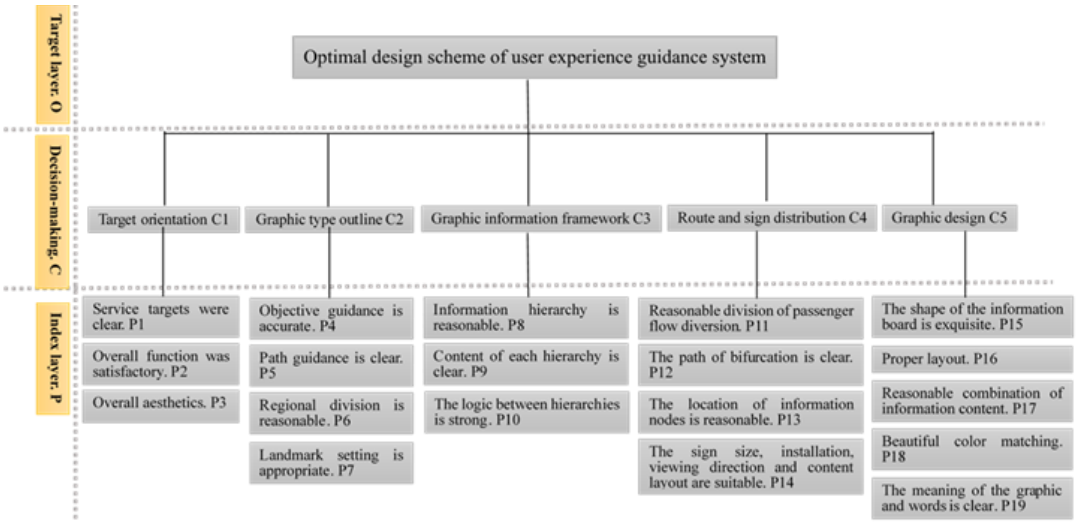

Figure 3：User experience graphic guidance system decision-making hierarchy model

Nanning public transport station case study

Nanning is the capital city of Guangxi province, China, and the permanent host city of the CAEXPO (CHINA-ASEAN Exposition). It is an important city from China to Southeast Asian countries. Every year, many domestic and foreign tourists come here to travel. In 2020, more than 2.55 million people visited the city during International Labor Day. Therefore, Nanning's public transportation station is particularly important. The guidance system can quickly and effectively evacuate the flow of people and provide convenient services for visitors. This research is to explore the design priority principle of a graphic-oriented system from the perspective of UX, so the survey places deliberately selected three traffic stations with a large number of people: Nanning East Station, Nanning Railway Station, Nanning International Convention and Exhibition Central station on Nanning Metro Line 1. The main features of these stations are centralized transfer and comprehensive shopping.

a) Select survey user

The study interviewed 60 visitors from the three stations, each half male and half male, and the ages were chosen between 18-60 years old. The age of the respondent, the purpose of the visit, local or non-local, and education level will

be recorded. A total of 180 people were interviewed, and the selected 150 people were recorded as valid data.

b) Interview process

First, the interviewer verbally answered, "What do you think an excellent guidance system should have?" and recorded it at the same time. Then, the respondent chose from the five levels of the questionnaire in order from the most important to the least important. Finally, the important design principles are selected from 5 levels.

c) Compile data

Visitors compared the weight of the five levels and the reasons were recorded. Combined with the experimental data of 150 investigators, the data of six judgment matrixes of Target O and Decision- making C, Decision -making C1 and Indicator layer P, C2 and P, C3 and P, C4 and P, C5 and P are obtained. Through software analysis, data are as show by Table 1 to Table 6 as follows:

Table 1: Judgment matrix of Target O and Decision-making C O-C (CI=0.0398)

		Target orientation C1	Graphic type outline C2	Graphic information framework C3	Route and sign distribution C4	Graphic design C5
Target orientation	C1	1	1/2	1/2	1/8	1/5
Graphic type outline	C2	2	1	3	1/5	1/4
Graphic information framework	C3	2	1/3	1	1/6	1/8
Route and sign distribution	C4	8	5	6	1	1
Graphic design	C5	5	4	8	1	1

Table 2: Judgment matrix of Target orientation C1 and Index P C1-P (CI=0.0311)

	Service targets were clear. P1	Overall function was satisfactory. P2	Overall aesthetics. P3
Service targets were clear. P1	1	1/7	1/6
Overall function was satisfactory. P2	7	1	2
Overall aesthetics. P3	6	1/2	1

Table 3: Judgment matrix of Graphic type outline C2 and Index P C2-P (CI=0.0058)

	Objective guidance is accurate. P4	Path guidance is clear. P5	Regional division is reasonable. P6	Landmark setting is appropriate. P7
Objective guidance is accurate. P4	1	1/2	4	3
Path guidance is clear. P5	2	1	7	5
Regional division is reasonable. P6	1/4	1/7	1	1
Landmark setting is appropriate. P7	1/3	1/5	1	1

Table 4: Judgment matrix of Graphic information framework C3 and Index P C3-P (CI=0.0176)

	Information hierarchy is reasonable. P8	Content of each hierarchy is clear. P9	The logic between hierarchies is strong. P10
Information hierarchy is reasonable. P8	1	1/4	3

Content of each hierarchy is clear. P9	4	1	8
The logic between hierarchies is strong. P10	1/3	1/8	1

Table 5: Judgment matrix of Route and sign distribution C4 and Index P C4-P (CI=0.0403)

	Reasonable division of passenger flow diversion. P11	The path of bifurcation is clear. P12	The location of information nodes is reasonable. P13	The sign size, installation, viewing direction and content layout are suitable. P14
Reasonable division of passenger flow diversion. P11	1	5	3	2
The path of bifurcation is clear. P12	1/5	1	1/2	1/5
The location of information nodes is reasonable. P13	1/3	2	1	1/4
The sign size, installation, viewing direction and content layout are suitable. P14	½	5	4	1

Table 6: Judgment matrix of Graphic design C5 and Index P C5-P (CI=0.0759)

	The shape of the information board is exquisite. P15	Proper layout.	Reasonable combination of information content. P17	Beautiful color matching. P18	The meaning of the graphic and words is clear. P19

		P16			
The shape of the information board is exquisite. P15	1	1/4	1/7	1	1/8
Proper layout. P16	4	1	1/6	4	1/8
Reasonable combination of information content. P17	7	6	1	7	1/2
Beautiful color matching. P18	1	1/4	1/7	1	1/7
The meaning of the graphic and words is clear. P19	8	8	2	7	1

The random consistency index values (RI) of the factors used in the decision-making process are as Figure 4.

Random consistency index value (***RI***) of factors used in decision making process

n	1	2	3	4	5	6	7	8	9	10	11	12
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.58

Figure 4: Random consistency index values (RI) of the factors used in the decision-making process

d) Analysis data

According to the data of five judgment matrices, the relative weight of each factor in each matrix is calculated, and the consistency test is carried out respectively.

Relative weight calculation and consistency test of judgment matrix (O-P) between Target level O and Decision-making P. The weight values of five levels are obtained by calculation: Route and sign distribution C4: 0.4036; Graphic design C5: 0.3766; Graphic type outline C2: 0.1092; Graphic information framework C3: 0.0602; Target orientation C1: 0.0504, and λmax=5.1784. According to the consistency index formula, the CI value is calculated as follows:

$CI = (\lambda max\text{-}n)/ (n\text{ -}1) = (5.1784\text{-}5)/ (5\text{-}1) = 0.0446.$

According to the random consistency index an of the factors used in the decision-making process, we can know that: RI=1.12, then calculate the consistency ratio:

CR=CI/RI=0.0446/1.12=0.0398 <0.1.

The consistency ratio of judgment matrix O-C (CR<0.1). Therefore, the data conforms to the consistency standard, and the consistency test shows that the data is scientific and reasonable, which is acceptable. According to the calculation results, the vast majority of users think that route and sign distribution is the most important in the guide system design, followed by graphic design, and most users pay less attention to target orientation.

Relative weight calculation and consistency test of judgment matrix (C1-P) between Target orientation C1 and index layer P. The weight values of three principles are obtained by calculation: Service targets were clear P1:0.0695; Overall function was satisfactory P2:0.5821; Overall aesthetics P3:0.3484, and λmax=3.0324. According to the consistency index formula, the CI value is calculated as follows:

$CI = (\lambda max\text{-}n)/ (n -1) = (3.0324\text{-}3)/ (3\text{-}1) = 0.0162$.

According to the random consistency index an of the factors used in the decision-making process, we can know that: RI=0.58, then calculate the consistency ratio:

CR=CI/RI=0.0162/0.58 = 0.0278 <0.1

The consistency ratio of judgment matrix C1-P(CR<0.1). Therefore, the data conforms to the consistency standard, and the consistency test shows that the data is scientific and reasonable, which is acceptable. From the perspective of the target orientation of the first level, users pay less attention to the service groups corresponding to a certain type of guide information but make a comprehensive evaluation on the satisfaction of the overall function.

Relative weight calculation and consistency test of judgment matrix (C2-P) between Graphic type outline C2 and index layer P. The weight values of four principles are obtained by calculation: Objective guidance is accurate P4:0.2896; Path guidance is clear P5:0.5355; Regional division is reasonable P6:0.0806; Landmark setting is appropriate P7:0.0943 and λmax=4.0155. According to the consistency index formula, the CI value is calculated as follows:

$CI = (\lambda max\text{-}n)/ (n -1) = (4.0155\text{-}4)/ (4\text{-}1) =0.0051$

According to the random consistency index an of the factors used in the decision-making process, we can know that: RI=0.9, then calculate the consistency ratio:

CR=CI/RI=0.0051/0.9=0.0056 <0.1

The consistency ratio of judgment matrix C2-P(CR<0.1). Therefore, the data conforms to the consistency standard, and the consistency test shows that the data is scientific and reasonable, which is acceptable. From this layer, users pay more attention to the clarity of path guidance and the accuracy of target prompts but pay less attention to the division of regions.

Relative weight calculation and consistency test of judgment matrix (C3-P) between Graphic information framework C3 and index layer P. The weight values of three principles are obtained by calculation: Information hierarchy is reasonable P8: 0.2051; Content of each hierarchy is clear P9:0.7167; The logic between hierarchies is strong P10:0.0783 and λmax=3.0183. According to the consistency index formula, the CI value is calculated as follows:

$CI = (\lambda max\text{-}n)/ (n\text{ -}1)$ = (3.0183-3)/ (3-1) =0.0091

According to the random consistency index an of the factors used in the decision-making process, we can know that: RI=0.058, then calculate the consistency ratio:

CR=CI/RI=0.0091/0.58=0.0157<0.1

The consistency ratio of judgment matrix C3-P(CR<0.1). Therefore, the data conforms to the consistency standard, and the consistency test shows that the data is scientific and reasonable, which is acceptable. From the perspective of a graphic information framework, users and experts prefer the clarity of hierarchical content and pay less attention to the logic between levels.

Relative weight calculation and consistency test of judgment matrix (C4-P) between Route and sign distribution C4 and index layer P. The weight values of four principles are obtained by calculation: Reasonable division of passenger flow diversion P11:0.4578; The path of bifurcation is clear P12:0.0716; The location of information nodes is reasonable P13:0.1232; The sign size, installation, viewing direction and content layout are suitable P14:0.3474 and λmax=4.1076. According to the consistency index formula, the CI value is calculated as follows:

$CI = (\lambda max\text{-}n)/ (n\text{ -}1)$ = (4.1076-4)/ (4-1) =0.0358

According to the random consistency index an of the factors used in the decision-making process, we can know that: RI=0.9, then calculate the consistency ratio:

CR=CI/RI=0.0358/0.9=0.0397<0.1

The consistency ratio of judgment matrix C4-P(CR<0.1). Therefore, the data conforms to the consistency standard, and the consistency test shows that the data is scientific and reasonable, which is acceptable. From the four principles of this layer, users pay more attention to the guiding system, which can reasonably divert the crowd and avoid congestion. At the same time, people pay attention to whether the guidance system follows ergonomics, in line with the perspective and proportion of people.

Relative weight calculation and consistency test of judgment matrix (C5-P) between Graphic design C5 and index layer P. The weight values of the five principles are obtained by calculation: The shape of the information board is exquisite P15:0.0404; Proper layout P16: 0.1027: Reasonable combination of information content P17:0.3308; Beautiful colour matching P18:0.0421; The meaning of the graphic and words is clear P19:0.4841, and λmax=5.3399. According to the consistency index formula, the CI value is calculated as follows:

CI = (λmax-n)/ (n -1) = (5.3399-5)/ (5-1) =0.0849

According to the random consistency index an of the factors used in the decision-making process, we can know that: RI=0.9, then calculate the consistency ratio:

CR=CI/RI=0.0849/1.12=0.7587<0.1

The consistency ratio of judgment matrix C5-P(CR<0.1). Therefore, the data conforms to the consistency standard, and the consistency test shows that the data is scientific and reasonable, which is acceptable. From the perspective of graphic design, users are most concerned about the accuracy and clarity of the meaning of graphics and text expression. Secondly, pay attention to the reasonable combination of guide information. On the contrary, the attention to colour matching is not high.

Calculation and ranking of the total weight

Through calculation, the relative weights of C1, C2, C3, C4, C5 and 15 indexes of P1-P19 are obtained. Relative weight and total relative weight of decision-making layer and index layer as Table 7.

Table 7: Relative weight and total relative weight of decision-making layer and index layer

Target layer O	Decision-making layer C	Weight of Decision-making layer	Index layer P	Relative weight of Index layer	Total relative weight
Good graphic guide system criteria-based user experience	Target orientation C1	0.0503	Service targets were clear. P1	0.0695	0.0035
			Overall function was satisfactory. P2	0.5821	0.0293
			Overall aesthetics. P3	0.3484	0.0175
	Graphic type outline C2	0.1092	Objective guidance is accurate. P4	0.2896	0.0316
			Path guidance is clear. P5	0.5355	0.0585
			Regional division is reasonable. P6	0.0806	0.0088
			Landmark setting is appropriate. P7	0.0943	0.0103
	Graphic information framework C3	0.1993	Information hierarchy is reasonable. P8	0.2051	0.0123
			Content of each hierarchy is clear. P9	0.7167	0.1823
			The logic between hierarchies is strong. P10	0.0783	0.0047
	Route and sign	0.4036	Reasonable division of passenger flow diversion. P11	0.4578	0.1848

	distribution C4		The path of bifurcation is clear. P12	0.0716	0.0289
			The location of information nodes is reasonable. P13	0.1232	0.0497
			The sign size, installation, viewing direction and content layout are suitable. P14	0.3474	0.1402
	Graphic design C5	0.3766	The shape of the information board is exquisite. P15	0.0404	0.0152
			Proper layout. P16	0.1027	0.0387
			Reasonable combination of information content. P17	0.3308	0.1246
			Beautiful color matching. P18	0.0421	0.0158

According to the value of the relative total weight of the indicator layer, it is sorted from small to large, as shown in Table 8.

Table 8: The total weight ranking table of each index

Index layer P		Weight
Reasonable division of passenger flow diversion.	P11	0.1848
The meaning of the graphic and words is clear.	P19	0.1823
The sign size, installation, viewing direction and content layout are suitable.	P14	0.1402
Reasonable combination of information content.	P17	0.1246
Path guidance is clear.	P5	0.0585
The location of information nodes is reasonable.	P13	0.0497
Content of each hierarchy is clear.	P9	0.0431
Proper layout.	P16	0.0387
Objective guidance is accurate.	P4	0.0316

Overall function was satisfactory.	P2	0.0293
The path of bifurcation is clear.	P12	0.0289
Overall aesthetics.	P3	0.0175
Beautiful color matching.	P18	0.0158
The shape of the information board is exquisite.	P15	0.0152
Information hierarchy is reasonable.	P8	0.0123
Landmark setting is appropriate.	P7	0.0103
Regional division is reasonable.	P6	0.0088
The logic between hierarchies is strong.	P10	0.0047
Service targets were clear.	P1	0.0035

Conclusion

This research starts with the theory of user experience and guidance system, analyzes and explores the five elements of user experience corresponding to the guidance system and the content of the guide system corresponding to each level, and builds a theoretical framework of the guide system based on user experience. The five elements (Strategy; Scope; Structure; Skeleton; Surface) of user experience correspond to the five levels (Target orientation; Graphic type outline; Graphic information framework; Route and sign distribution; Graphic design) of guidance system design, and five 19 design principle elements (Service targets were clear; Overall function was satisfactory; Overall aesthetics; Objective guidance is accurate; Path guidance is clear; Regional division is reasonable; Landmark setting is appropriate; Information hierarchy is reasonable; Content of each hierarchy is clear; The logic between hierarchies is strong; Reasonable division of passenger flow diversion; The path of bifurcation is clear; The location of information nodes is reasonable; The sign size, installation, viewing direction and content layout are suitable; The shape of the information board is exquisite; Proper layout; Reasonable combination of information content; Beautiful color matching; The meaning of the graphic and words is clear) corresponding to the level. On this basis, the research adopts a combination of expert interviews and user experience questionnaires. The AHP research method determines the priority values of the five levels of the guidance system and the design principles of its indicators provide a model for the evaluation of the guidance system design plan and provide useful guidance for the design of the guidance reference.

According to statistical analysis of data, the most significant result of users' preference for the five levels of the guidance system is that C4: Route and sign distribution accounts for 40.36% of the overall weight, of which indicator P11: Reasonable division of passenger flow diversion accounts for 45.78% of the weight of this level. Index P14: The sign size, installation, viewing direction and content layout are suitable accounted for 34.74%. Secondly, C5: Graphic design accounted for 37.66% of the overall weight, of which indicators P19: The meaning of the graphic and words is clear and P17: Reasonable combination of information content accounted for 48.41% and 33.08% of the weight of this layer, respectively. However, for users, the abstract level of C3: Graphic information framework, C2: Graphic type outline and C1: Target orientation shows a gradual decrease in attention, which accounts for 19.93%, 10.92% and 5.03% of the total weight, respectively. The data shows that user experience is achieved mainly through two levels of concrete C4: Route and sign distribution and C5: Graphic design. This is also in line with the three levels of emotional design, which trigger the visual level and then the behavior level through the physical objects seen by the user, and finally completes the reflection level of the experience (resonance, satisfaction, or pleasure).

The next research focuses on the two levels of concreteness (C4: Route and sign distribution and C5: Graphic design) to explore the specific design plan of the user experience guidance system (such as graphics, text, layout, color, information level, etc.) optimization model and explore guidance from the three levels of emotional design. It depends on how the system makes users feel emotional, happy, or satisfied.

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