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Research on public library user profile based on conceptual grid in the context of cultural and tourism integration

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Abstract

This study aims to enhance the cultural tourism service capabilities of public libraries to meet the diverse cultural tourism needs of users. To achieve this goal, Python was used to obtain user review data of the National Library of China from the Dianping website, and based on these data, a conceptual model of public library cultural tourism user portraits was constructed. This model covers three dimensions: user natural attributes, user needs, and user travel scenarios. Subsequently, the Lattice Miner 2.0 tool was used to construct user segmentation label concept lattices, and the user groups were divided into four categories through the Hasse diagram of the concept lattice: tourist check-in and novelty seekers, leisure and entertainment enjoyers, reading, learning and advanced study enthusiasts, and parent-child activity experiencers. Thus, the construction of public library group user portraits was realized. The research shows that through in-depth mining and clustering analysis, these four types of user groups and their unique cultural tourism needs can be clearly identified. This user-oriented research perspective focuses on the overall process of user portrait construction, which not only helps to optimize the cultural tourism service level of public libraries but also significantly improves user satisfaction, demonstrating important practical value and innovative significance.

Keywords

user profiles, public libraries, conceptual grids

1. Introduction

In the context of today's era of cultural and tourism integration, public libraries, as traditional cultural service organizations, are facing unprecedented

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development opportunities and challenges. Compared with the single reading and lending function in the traditional context, public libraries present significant new features in the process of cultural tourism integration. On the one hand, public libraries are no longer limited to traditional book lending and reading venues, but are gradually transformed into comprehensive spaces integrating cultural and tourism elements, becoming new landmarks of urban culture and attracting tourists and local residents alike. The design of the libraries pays more attention to the creation of a cultural atmosphere and the enhancement of tourism experience, not only possessing a rich collection of books and resources, but also adding functional areas such as special cultural exhibition areas and cultural experience activity areas. On the other hand, public libraries actively collaborate with the tourism industry, launching thematic cultural tourism routes, organizing cultural tourism lectures and other activities, and deeply integrating cultural dissemination with tourism experience. In this context, how to realize the accurate positioning of public library users through user big data is directly related to the service experience of users and the sustainable development of public libraries. As a technical tool capable of realizing the association of user attributes and behaviors, user portrait has become an important means of realizing accurate service in the era of big data, and has been widely used in the fields of computer and e-commerce. Formal concept analysis constructs a concept lattice through the formal background, which can comprehensively retain the data details, so the theory and technology based on the concept lattice have significant advantages in mining the association between user attributes and the laws of user behavior and needs.

In view of the above reasons, this paper applies the concept of user image to the analysis of public library group users in the context of cultural tourism integration, analyzes the attribute characteristics of public library users from the three dimensions of user's natural attributes, user's needs, and user's travel scenarios, and constructs the conceptual model of user image, which facilitates the libraries to comprehensively and deeply understand the user's needs, and provides the data support and direction for the optimization of the construction of the services of public libraries[1]. The conceptual model of user profile is constructed to facilitate the library's comprehensive and in-depth understanding of user needs and provide data support and direction for the optimization of public library services.

2. Literature review

2.1. Current status of research on cultural tourism integration in public libraries

Since the establishment of the Ministry of Culture and Tourism in 2018[2] , with the successive introduction and implementation of a series of policies to promote

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the integration of culture and tourism, scholars in the field of libraries have quickly realized the important opportunities in the context of this era, and have carried out an increasing number of research and practical activities around the integration of culture and tourism. Domestic and international academic discussions on public libraries in cultural tourism integration mainly focus on several aspects such as integration mechanism, integration strategy and practice cases.

Culture is the soul of tourism, tourism is the carrier of culture[3] . Public libraries and tourism have a natural coupling. Gao Wenhua[4] emphasizes that public libraries have a wide sense of presence, a high degree of integration, and a comprehensive service capacity, and these characteristics enable them to provide solid support for the cultural and tourism service system. This service capacity is the foundation and premise for realizing the integration of public libraries and cultural tourism. Analyzing from the perspective of internal mechanism, Shan Hongbo[5] points out that the core driving force of the integration of culture and tourism originates from the actual needs of the development of culture industry and tourism, and the role and mission of libraries in the integration of culture and tourism are the key factors to promote this process. Lin Xiaojin[6] points out that improving and upgrading the public cultural service system can better meet the needs of the in-depth integration of the culture and tourism industries, thus promoting the substantial progress of the integration of culture and tourism. Chen Li[7] suggests that in the process of culture and tourism integration, libraries not only need to have the connoisseurship of cultural resources, but also the ornamental nature of tourism resources. From the perspective of external mechanism, a number of scholars have pointed out that the establishment of the Ministry of Culture and Tourism, the revision and promulgation of national laws and regulations such as the Tourism Law of the People's Republic of China and the Law of the People's Republic of China on the Guarantee of Public Cultural Services, provide a brand-new policy background and institutional environment for the development of the integration of culture and tourism. These factors constitute the external support and driving force for cultural tourism integration, creating favorable conditions for public libraries to participate in cultural tourism integration. The driving force for public libraries to participate in the integration of culture and tourism not only covers the intrinsic demand of the public cultural service system, the mission of the libraries themselves, the transformation and upgrading of the tourism industry, but also includes a variety of factors such as policy protection, institutional conditions and technical support. These factors interact and influence each other, and jointly promote the innovation and development of public libraries in the field of cultural and tourism integration. For example, policy support and institutional construction provide a solid legal foundation for libraries, while technological power enhances their service capacity and user experience, enabling public libraries to better fulfill their

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functions of cultural dissemination and social value in the new environment. Through this multi-dimensional support system, public libraries are not only able to meet the needs of the in-depth integration of the culture and tourism industries, but also continue to innovate in practice, further enhancing their status and role in the integrated development of culture and tourism.

In terms of the path selection of libraries' participation in cultural tourism integration, most scholars mainly discuss it through typical cases. Yanqing Dai[8] and others proposed a framework for public library cultural tourism integration based on the two dimensions of "deep cultivation inside the library" and "connection outside the library". The "in-library deep cultivation" dimension focuses on the construction and development of libraries themselves, and can be divided into information-based integration and immersion-based integration according to the depth of integration; the "out-of-library connection" dimension emphasizes the cooperation between libraries and other organizations, and can be subdivided into embedded integration and immersion-type integration according to the content and form of integration. The dimension of "out-of-library connection" emphasizes the cooperation between libraries and other organizations, which can be subdivided into embedded fusion, cultural and creative fusion and research fusion according to the content and form of fusion. Song Wei [9] from the perspective of "library +" in the context of cultural and tourism integration, put forward three specific paths: to build a cultural tourism brand, to build a cultural and tourism reading platform, and to become a famous tourist attraction. She also pointed out that in implementing these paths, it is necessary to apply systematic thinking, starting from the utilization of resources and focusing on the strategy of bringing in and going out. For example, public access to libraries should be attracted by organizing special service activities such as study tours and setting up thematic branch libraries around scenic spots or attractions in order to extend the scope of services, integrating reading into tourist attractions, and promoting the in-depth integration of culture and tourism with science and technology. This kind of multi-angle and multi-level research not only provides theoretical support for how public libraries can better participate in the integration of culture and tourism, but also demonstrates the possibilities and effects of actual operation through specific cases and strategies. Through these paths, public libraries can not only improve the quality of their own services, but also play an important role in the wider field of culture and tourism, and achieve the maximization of cultural heritage and social value.

2.2. Overview of User Profiling

Alan Cooper[10] , the father of interaction design, first proposed the concept of user profiling. He defined user profile as "virtual representation based on real user data", i.e., by integrating the information of users' social attributes, living habits and consumption behaviors, the typical characteristics of one or a class of users are extracted and the information is structured. In D. Travis' research, this concept

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is further deepened by the use of the word "Persona" (consisting of seven initials) to summarize the core elements of a user profile: basicness, empathy, authenticity, uniqueness, purpose, quantity, and applicability. Together, these elements form the theoretical foundation and practical framework of user profiling.

There are two levels of definitions of user portraits. The first level of User Persona is the image of a typical user that is abstracted from the target user group during the product design and operation process. This user profile aims to express and focus on the main needs and expectations of the most important user groups. For example, Lerouge[11] et al. proposed a framework for constructing user profiles based on mind mapping. The framework employs methods such as open-ended surveys and in-depth interviews aimed at extracting specific characteristics of users. The effectiveness of this method is based on the fact that the designer has full knowledge of the target user group. When faced with data scarcity, the method is difficult to quantitatively analyze the association between user data and portrait features. The second level of user profile is a collection of labels describing user attributes and behaviors based on real user behavior data in a specific usage context. This level of user profile has more authenticity and strong timeliness, and the portrayal of the user focuses on grasping fine-grained and multi-dimensional. This paper constructs user profiles for this level. In the context of the big data era, the construction of user profiles is generally based on text mining, data mining and other big data technologies, the user behavior is analyzed to form a collection of user labels, and a recommendation system is established based on user profiles.

2.3. Conceptual lattice theory

Conceptual lattice, as a formalized knowledge representation, has significant advantages in the field of information processing. The model can effectively support data analysis and knowledge mining tasks by establishing correspondence between objects and attributes. Its core value is reflected in three aspects: first, it reduces information redundancy by organizing conceptual relationships through a systematic hierarchical structure; second, it supports the extraction of association rules and classification rules, providing technical support for knowledge discovery; and finally, it can integrate multidimensional attributes to reveal potential associations among data. In terms of user portrait construction, the theoretical framework of concept lattice has a similar logical basis with the establishment of labeling system. Specifically, the user portrait describes user characteristics through static and dynamic labels, while the conceptual lattice characterizes object features through a collection of attributes, and the two are consistent at the methodological level. This correspondence provides a new analytical perspective for user research in public libraries. Based on the concept lattice theory, user attributes of different dimensions can be visualized and presented through the partial order relationship between nodes. This method can not only clearly show the distribution of user group characteristics, but also reveal the potential association between different attributes, providing data support and

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decision-making basis for library service optimization. By applying the conceptual grid to user profile analysis, a deeper understanding of user needs can be realized, thus enhancing the service effectiveness of public libraries.

Lattice Miner 2.0 can compute and display the complementary background of the current formal background, and convert between ordinary 2D formal background and embedded formal background, which is more suitable for dealing with complex formal concepts[12] . In addition, Lattice Miner 2.0 is more suitable for mining association rules and is more in line with the expression habits of most users in terms of rule formulation, and its function of presenting association rules in the form of labels in the conceptual lattice view combines the association rules with concepts (nodes) in the conceptual lattice view, which facilitates the users' understanding of the association rules. Therefore, this paper chooses the software Lattice Miner 2.0 to construct the conceptual grid of public library user portrait.

2.4. Summary of the study

By combing the research results of scholars at home and abroad on the integration of user image and public library cultural tourism, it can be found that the existing research mainly focuses on two directions: the first is the application research of user image, and the second is the practical exploration of the integration of public library cultural tourism. However, there is still a lack of research related to the systematic application of user image technology to the scenarios of cultural tourism integration in public libraries. Based on this, this study takes user image technology as an entry point to explore its innovative application in public library cultural tourism integration, aiming to provide new theoretical perspectives and practical solutions to promote the development of cultural tourism integration, which has important innovative significance and practical value.

3. Research design

3.1. User Profile Analysis Process

This study contains two main core parts. The first part focuses on the construction of the conceptual model of user portrait. Based on the user perception perspective, through the systematic research of user review data in public libraries, the basic data are obtained and organized to provide support for the subsequent analysis. The second part is the realization of the user portrait model based on the conceptual grid. Specifically, the conceptual lattice of user segmentation labels is constructed first, followed by group user clustering based on the Hasse diagram of the conceptual lattice, and the characteristics of each user group are described in detail.

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3.2. Data sources

The development of online evaluation platforms and the new cultural forms promoted by the integration of culture and tourism have shown a remarkable symbiotic relationship. As the crystallization of technological evolution and cultural communication in the era of media integration, online evaluation platforms have the dual attributes of public discourse space and public consumption guidance. The flourishing development of these platforms has not only reshaped the communication mode of cultural tourism, but also provided an important carrier for the cultivation of library's special cultural tourism culture. In this process, the network evaluation platform has gradually evolved into an important window for displaying the cultural tourism characteristics of libraries, forming a unique digital cultural landscape. Users actively participate in the evaluation interaction through the platform, which not only shapes the digital image of the library's cultural tourism services, but also provides a decision-making reference for potential consumers, thus promoting the dissemination and innovation of the library's cultural tourism culture.

Public online reviews of libraries are widely distributed across social media platforms and third-party review platforms. As far as social media is concerned, the mainstream channels cover platforms such as Weibo, Xiaohongshu and Jieyin. In terms of user composition, Weibo and Xiaohongshu are dominated by the post-90s young group, with relatively insufficient participation from middle-aged and older users[13][14] ; in contrast, the age distribution of users on the Jitterbit platform is more balanced. In terms of content characteristics, the reviews on these platforms are mostly limited to keyword matching or video content summarization, and the description of real experience is relatively scarce, which to some extent restricts the depth of analysis. Third-party review platforms include mainstream service providers such as Dianping, Ctrip and Ma's nest. Among them, Ctrip and MaMeeWo are mainly oriented to the travel group, and their users are mostly foreign tourists; while Dianping, as a local life service platform, covers a wide range of fields such as leisure and entertainment, education and training, and tourism and shopping, and can reflect the characteristics of a wider user group. As far as content quality is concerned, the evaluation of third-party platforms is mostly based on actual consumption experience, which has stronger relevance and reference value.

Taking into account the factors of content acquisition, user structure, and review scale, this study selects Volkswagen Dianping.com as the data source, and takes the National Library review data in Volkswagen Dianping website as the research object. The National Library is located in Zhongguancun, Beijing, adjacent to the Baishiqiao Gaoliang River and Zizhuyuan Park in Haidian District, which is the national general library and one of the largest and most advanced national libraries in the world. With its rich collection, grand scale and long history, the National Library has become an attraction that many tourists are happy to visit. A

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total of 481 reviews of the National Library from January to October 2024 were crawled using python as a dataset for this paper.

3.3. Selection of typical users

The screening of typical users is a key initial step when applying formal conceptual analysis. This screening process directly affects the fineness of the labeling system and the completeness of the portrait results. Based on the data characteristics of the VWP platform, this study adapts the traditional RFM model and constructs a typical user screening mechanism applicable to library scenarios to ensure the validity and reliability of the subsequent analysis. The classical RMF model was proposed by Hughes[15] and widely used in customer segmentation, which is an important tool and instrument to measure customer value and customer profit-generating ability. In the RFM model, R(recency) denotes the time interval between the customer's most recent purchase and the present, F(frequency) denotes the frequency of the customer's purchases in the most recent period of time, and M(monetary) denotes the amount of the customer's purchases in the most recent period of time. For public library users, there is no direct profit-generating behavior, and the commenting behavior and user-generated content of public library users can be equated to the purchasing behavior and purchasing power of customers. Therefore, combining the RFM model with the reality of public library users, each index is adjusted, and finally the improved RFM model is obtained: the consumption interval (recency) is converted into the user level; the consumption frequency (frequency) is converted into the number of user's postings; and the consumption amount is converted into the user's registration years. The average value of the three indicators, namely user level, number of posts made by the user and the number of years the user has been registered, is calculated, and the user group is categorized into 8 types of representative users based on the average value of the three indicators. With the upper arrow to indicate that the indicators are higher than the mean value, and the lower arrow to indicate that the indicators are lower than the mean value, 2 users are selected as typical samples for each type of user, and the specific classification and the list of users are shown in Table 1. With the development of big data as well as artificial intelligence, the information privacy concerns of citizens are gradually deepening[16], so in order to protect user privacy, the user IDs are processed for privacy.

Table 1 : Typical user table

norm			
R	M	F	user ID
↑	↑	↑	Obj 1
			Obj 2
↑	↑	↓	Obj 3
			Obj 4

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↑	↓	↑	Obj 5 Obj 6
↓	↑	↑	Obj 7 Obj 8
↑	↓	↓	Obj 9 Obj 10
↓	↑	↓	Obj 11 Obj 12
↓	↓	↑	Obj 13 Obj 14
↓	↓	↓	Obj 15 Obj 16

3.4. Mapping model segmentation dimensions to user segmentation labels

The labeling process of user characteristic attributes is essentially a key step in the systematic reconstruction of user information, and this process is conducive to the realization of machine readability and batch processing of data. In order to ensure that user profiles can comprehensively and accurately reflect user characteristics, must perform dimensional segmentation of the conceptual model of user profiles and accurately map it to user segmentation labels.

The user labeling system mainly covers three categories: natural attribute labels, demand attribute labels and travel scene attribute labels. Among them, the natural attribute labels are composed of basic information such as user ID, gender and age, which are used to describe the basic characteristics of users; the demand attribute labels are generated by manual annotation based on the considerations of data scale and label accuracy, specifically including four categories of reading, punching card, exhibition and study, which are aimed at reflecting the core needs and behavioral preferences of the users; and the travel scenario labels are further refined into four types: single, friend, couple and parent-child, which are used to portray the social situations and travel characteristics of users when they use public library services. The travel scene labels are further refined into four types: single, friend, couple and parent-child, which are used to portray users' social situations and travel characteristics when using public library services. The construction of this labeling system provides a multi-dimensional data base for subsequent user profile analysis.

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4. Implementation of user profile model based on conceptual lattice

4.1. Construction of a conceptual grid of user segmentation labels

The construction of the conceptual grid requires the generation of a formal context based on the mapping of library literacy user labels. The result of user label mapping is represented as two-dimensional tabular data, which contains some quantitative information about the user's natural attributes. In order to effectively transform this information into a conceptual grid, a conceptual transformation[17] of the user label mapping results is required, i.e., the formal context is transformed into a single-valued binary context consisting of qualitative data and a single-valued context. This process involves transforming quantitative feature labels into qualitative single-valued data. With the help of the mean value transformation method proposed by Haitao Zhang[18], the user's quantitative labels are transformed into qualitative data using the mean value as a threshold. Specifically, by calculating its mean value for quantitative data and using this mean value as a benchmark, data above or below this mean value are labeled as different qualitative categories, respectively. This approach not only simplifies the data structure, but also makes the subsequent conceptual grid construction more efficient and accurate. The transformed label mapping results are shown in Table 2, demonstrating the specific changes from raw quantitative data to qualitative single-value data.

Table 2: User label mapping results

causality	serial number	Basis of division
age	A1	Youth: 19 to 35 years old
	A2	Middle age: 36 to 59
	A3	Older: over 60 years of age
distinguishing between the sexes	B1	male
	B2	female
user needs	C1	read
	C2	clock in
	C3	view an exhibition
	C4	research and study
travel scene	D1	single person
	D2	mate
	D3	lovers
	D4	parent-

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child(relationship)

After completing the data transformation, Lattice Miner 2.0 software is utilized to construct a formal context based on user segmentation labels, which is systematically approximated and purified. On this basis, the concept lattice Hasse diagram is generated, which is an effective tool for displaying the partial order relationship between objects and attributes. The partial order relationship between objects and attributes in the conceptual lattice determines the hierarchical structure among concepts, and all the concepts and the set of sequences they form together constitute a complete conceptual lattice in the context of the form. In the constructed concept lattice, super-concepts have wider extensions than sub-concepts, while sub-concepts have richer connotations. This hierarchical relationship is clearly demonstrated by the conceptual grid formed by the user segmentation labels. Dark blue semi-circle nodes represent concepts with a single attribute, light blue semi-circle nodes indicate concepts containing a single object, and white circle nodes indicate potential concepts. The node size reflects the number of objects it covers, with larger nodes implying more objects. The numerical labels on each node not only show the number of objects covered by the concept, but also provide the corresponding probability values, thus providing a solid basis for quantitative analysis. As the concept hierarchy progresses, the attributes possessed by each layer of concepts gradually increase, while the number of objects corresponding to these concepts decreases accordingly, and ultimately a particular object can be pinpointed.

User clustering through the conceptual lattice realizes multi-dimensional comprehensive classification, which can not only reveal the attribute characteristics of each category of user groups, but also get the hierarchical ranking of each characteristic of the group of users through the conceptual hierarchy, identify the core characteristics of the user group, and construct a more accurate user portrait. In addition, different granularity of user profiles can be constructed according to the conceptual hierarchy and combined with the actual demand for the granularity of user profiles. Due to the diversity of user attributes and the dynamics of user behavior and information needs, the same user may be classified into different categories of user groups, which is fully compatible with the differentiation of user behavior and needs in different situations. Similarly, the segmentation labels that members of various user groups have are also cross-cutting. According to the conceptual grid of user segmentation labels, user groups can be initially categorized into four groups: travelers, recreational users, readers and learners, and parent-child activities experiencers.

4.2. Construction of user profiles based on conceptual grids

The Lattice Miner 2.0 software allows you to click on a concept node to display all the related nodes that contain the connotations of that concept. All the attributes

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covered by these nodes are the attributes of the cluster. As the level of the concept grid increases, the importance of the attributes for the cluster decreases.

4.2.1. Tourism punch card tasters

This group is keen on exploring and trying new things, especially with the goal of traveling, taking photos and hitting the streets. They tend to choose public libraries with unique, eye-catching and highly designed shapes, and pursue distinctive experiences. Their service preferences focus on four aspects: architectural style, thematic design, interior environment and geographical location, with satisfying visual aesthetics being a key factor influencing satisfaction. Unique architectural appearance, well-designed themes, cozy internal environment and convenient location not only attract their attention, but also become important content they share on social media. A beautifully designed and unique building appearance not only brings visual enjoyment, but also becomes an unforgettable point of memory during the trip, further increasing its popularity and influence through word-of-mouth communication. Therefore, creating spaces with strong visual impact and cultural connotations can attract more travelers to visit and enhance the overall experience.

4.2.2. Persons enjoying leisure and recreation

This category of user groups has a wider range, covering a variety of needs such as office, leisure and self-study. They pay more attention to the environmental comfort, sense of atmosphere and convenience of library reading space. Their service preferences are mainly focused on five aspects: internal environment, convenience services, opening hours, temperature-controlled facilities and space services. These users seek a quiet and friendly, neat and orderly spatial environment, paying particular attention to optimizing the detailed settings of the spatial environment. Comfortable seating, appropriate lighting, adequate power outlets and high-speed Wi-Fi and other detailed settings can significantly enhance the user experience. In addition, reasonable layout design, such as providing independent work areas and open communication areas, can also meet the needs of different users. In a cozy atmosphere, users can better focus on their work or relax and enjoy a peaceful time.

4.2.3. Reading to learn to advance learners

This group of users focuses more on traditional reading, with books as the core, and their main goals include reading, buying, studying, checking out and borrowing books, as well as pursuing further education on their own. For this group of readers, the basic services of public libraries are their immediate needs, which mainly include the types of collection resources, updating speed, resource utilization, lending services, book and additional product sales and reading facilities. Therefore, taking books as the core, extending the series of products and cultural services, creating a favorable reading atmosphere, and providing inclusive and high-quality reading services can greatly enhance the sense of

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accessibility for those who study and advance in reading. Rich resource types and fast update speed ensure that readers have access to the latest and most comprehensive knowledge content. Efficient resource utilization and convenient borrowing services further enhance the user experience. In addition, the provision of diversified books and additional products for sale, such as stationery and cultural and creative products, not only meets readers' practical needs, but also enhances their cultural consumption experience. Comfortable reading facilities, such as ergonomically designed seats, appropriate lighting conditions and a quiet environment, enable readers to read and study at their best.

4.2.4. Parent-child activity experiencers

This user group is mainly parents, whose main goal as companions is to accompany their children to public libraries to read, study and participate in various activities, as well as to purchase the books needed for their children, with the aim of fostering their children's reading habits and improving their reading skills. These parents prefer the following six services: reading promotion services, sale of books and additional products, convenience of location, quality of spatial services, professional guidance capacity and quality reading facilities. In order to better meet these needs, new public reading spaces need to provide a wealth of reading promotion activities, such as parent-child book clubs, storytimes, and meet-the-author sessions, to stimulate children's interest in reading. At the same time, diversified book and add-on product sales services not only facilitate parents to buy suitable reading materials for their children, but also enhance their cultural consumption experience. Convenience of location and high-quality space services are also key concerns for parents, ensuring that they can easily reach and enjoy a comfortable environment. In addition, professional reading instruction and educational services are especially important. With the help of professional children's reading instructors or librarians, parents and children can receive personalized reading advice and support to establish good reading behaviors. Quality reading facilities, such as age-appropriate seating, interactive reading corners and quiet study areas, can also significantly enhance the experience of parent-child activities.

5. Conclusion

Based on the existing research results, this study constructs a set of user portrait analysis framework for the user characteristics of public libraries in the context of cultural and tourism integration. The construction process of the framework is mainly divided into two stages: firstly, the conceptual grid structure is constructed by mapping the public library cultural and tourism user labels; secondly, the conceptual grid of user labels is utilized to conduct a cluster analysis of the cultural and tourism users in the library, and finally four types of user portrait types with

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significant characteristics are identified. The conclusions of the study can provide theoretical basis and practical guidance for public libraries to optimize their services in the context of cultural tourism integration. However, there are still several limitations in this study: first, the empirical study only takes the National Library users on Volkswagen.com as a sample, failing to integrate multi-source data, and the sample coverage is limited; second, the data transformation adopts the mean processing method to construct the background of the user labeling form, which may lead to the lack of refinement of the sample data. Future research will expand the sample scope to include data from users of different public libraries and adopt a more precise quantitative data conversion method to enhance the granularity precision and representativeness of user profiles.

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