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## Research on the Realization Mechanism of Public Digital Library Service Accessibility

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**ABSTRACT**

Public digital libraries are an important part of the public cultural service system, and improving the adaptability of their supply to public demand can help promote the quality and efficiency of public digital cultural services. This study took residents of Province G of China as the target population, constructed evaluation indicators of public digital library service accessibility, and analyzed its influencing factors from the perspective of "individual-family-community". The study found that the match between supply and demand of public digital libraries in Province G needed to be improved, and there was a gap between the service level and the public's expectation, so the overall accessibility rating was average. Influencing factors included personal information retrieval skills, family members' participation in cultural activities, community network conditions and publicity efforts. Based on this, this study proposed optimization suggestions on how to improve the awareness and accessibility of public digital library services.

**Keywords** public digital libraries; accessibility; matching supply and demand; influencing factors; three-dimensional perspective

## 1. Introduction

The report of the Twentieth Party Congress states, "Implement the national strategy for cultural digitization, improve the modern public cultural service system, and innovate in the implementation of cultural projects that benefit the people." In the face of the epochal theme of cultural digitization, General Secretary Jinping Xi has profoundly grasped the characteristics and laws of socialist cultural construction in the information age, closely focused on better meeting the spiritual and cultural needs of the people, accelerating the deep integration of cultural services and digital technology, adapting to the development trend of digital industrialization and industrial digitization, accelerating the development of new cultural forms, transforming and upgrading the traditional cultural forms, and improving the quality, efficiency and core competitiveness of cultural services. Therefore, it is of great significance to take public digital libraries as a path to enhance the accessibility of public cultural services. Providing services to the public is one of the basic functions of the government, and the construction of public digital libraries, which is an important part of public services to meet the cultural needs of the public, has received widespread attention in recent years. After combing through the literature, it is found that relevant studies on the accessibility of public cultural services mainly focus on the analysis of the matching of supply and demand of public cultural services in China, the construction of the accessibility evaluation framework, and the analysis of the path of enhancement, etc. Firstly, in terms of matching supply and demand, although the construction of the public cultural service system has achieved certain results, there are problems of matching supply and demand that need to be improved, and these problems constrain the development of the accessibility of public cultural services(Na Cui, Xiangming Liang, 2021); the supply and demand problem of China's public cultural services is mainly the gap between service supply and spiritual demand (Jingui Yuan, Yang Yu, 2015); the top-down decision-making mechanism and the supply model is an important factor affecting the imbalance between supply and demand of China's public cultural service system (Xueyan Hou, 2020). Secondly, in the construction of accessibility evaluation system, the accessibility of public cultural services is the "suitability" between the public and the public cultural service system, and the evaluation framework of public cultural service accessibility can be set up from the four dimensions of accessibility, proximity, acceptability and adaptability(Qian Wang and Licai

Wu, 2015;Yuting Xie,2021 ; Lanlan Qian and Jiantao Wang,2022). Finally, in terms of the accessibility enhancement path, digital construction can help promote the precise supply of public cultural services and enhance the accessibility of public cultural services (Wenyu Jiang, Junwen Cao, 2018; Xian Feng, Jin Li, 2021); to match the cultural needs of all parties, focusing on the integration of diverse resources; to improve the effectiveness of the service, strengthen the cooperation between the government and society to provide; to establish a dynamic evaluation and feedback mechanism to achieve the precise supply of public services , which is the main path to improve and optimize the construction of public cultural service system in the new era (Lanlan Qian and Jiantao Wang, 2022).

To summarize, in recent years, research on public digital libraries and the accessibility of public cultural services has been carried out in full swing, and Province G, as a cultural powerhouse, is committed to promoting the improvement of the quality and efficiency of public digital cultural services, and constantly develops and improves the construction of public digital libraries. Although the digitization of public cultural services in Province G has made certain achievements in recent years, to what extent does the supply of public digital libraries match public demand, i.e., how accessible are public digital libraries in terms of cultural services? What factors affect the accessibility of cultural services of public digital libraries, and how to provide the right amount of appropriate and effective public digital cultural services? These questions deserve further exploration. Currently, there are relatively few studies on this perspective, which leads to the lack of practical basis for the selection of paths to improve accessibility and the ambiguity of enforceability. Therefore, based on the theory of matching supply and demand, this study takes the residents of Province G as the research object, obtains the current situation of matching supply and demand of public digital library cultural services through quantitative empirical research, explores the paths to improve the matching degree, and analyzes the degree of influence on accessibility at the level of the individual, the family, and the community, in order to provide suggestions for improving the accessibility of public digital library cultural services in Province G.

## II. Construction of public cultural services in Province G: supply of cultural services in digital libraries

In response to the provincial party committee and the provincial government to create a digital culture to lead the place, and promote the high-quality development of public digital cultural services, G public libraries in the digitalization of the construction of public libraries continue to make efforts. The use of digital and network technology, libraries to provide a wealth of digitized documentary resources and services, breaking the physical limitations of traditional libraries, so that users can access all kinds of information at any time and any place through the network, which greatly promotes the sharing and use of knowledge. According to the Report on the Development of Public Library Business in Province G in 2021, of the 149 public libraries above the county level within Province G, 30 have opened microblogging services, 140 have opened WeChat services, and 113 have ventured into the field of third-party short video services. These libraries have actively docked with national-level public digital cultural service platforms and integrated various information dissemination platforms, such as websites, WeChat, Weibo, Jitterbug, APPs and mobile terminals such as the WeChat mini-programs of the Culture E-station in Province G. They have constructed a new media propaganda matrix so that the public can fully enjoy the dividends brought by cultural information.

In terms of digital resource provision, public library G stands out. For example, the digital resources navigation section of Library X provides a wide range of digital resources such as e-journals, e-books and audio/video resources for readers to access conveniently. Meanwhile, the smart service platform of G Library Society also has a number of functions, including membership management, meeting management, mobile service, and information dissemination, etc. Through the platform, the Society is able to disseminate information on the latest news, career reports, and scientific research progress to the public in a timely manner. The organization of online activities is also a highlight of the digitization construction of G public libraries. In recent years, the number of online activities organized by public libraries at county level and above and the number of participants have shown a rising trend year by year in Province G. In 2021, the number of online activities organized was as high as 16,499, and the participation rate of readers even reached 59.9%. At the technical service level, most of the public libraries in Province G have already realized online card services. The construction of the "Guangdong Reading Pass" service system, led by the Z Library of Province G, has successfully extended the scope of service to municipal and some county (district) level public libraries through the docking of e-certificates, realizing the interconnection, interoperability, and mutual recognition of readers and users' information within the province, and effectively facilitating inter-library sharing and use of public cultural resources.G Public libraries also pay special attention to the interests of special groups, such as the elderly and disabled groups, in their digitization construction. For example, the "Guangtu-Blue Vest Public Welfare Walk" series of activities initiated by the X Library in cooperation with the Y Newspaper Industry provides a digital life for the elderly in various forms, such as "online classroom" and "offline lectures". Through a variety of forms, the library provides digital life operation skills training and anti-fraud and anti-scam publicity and education for

the elderly, and opens a special column line and green channel for them. The library also focuses on improving the professionalism and information skills of grassroots staff (Shaoying Mao and Jun Ren, 2020), and regularly organizes public digital culture training.

## III. Evaluation of the accessibility of cultural services in public digital libraries

(i) Analytical framework for accessibility evaluation

Qian Wang and Licai Wu (2015) proposed that the accessibility of public cultural services as a concept of evaluating the "suitability" between the public cultural service system and urban and rural residents can be evaluated from the four interrelated dimensions of accessibility, proximity, acceptability and adaptability. As an important part of public cultural services, the goal of public digital library cultural services is also to meet the cultural needs of the people, and the process of service provision is also faced with the issue of "suitability" between supply and residents' needs. Therefore, this study evaluates the accessibility of public digital cultural services based on the evaluation framework of four dimensions: accessibility, proximity, acceptability and adaptability. It should be noted that, different from traditional public cultural services and traditional public libraries, public digital library cultural services are a product of the digital era, with distinctive characteristics of the times, and must be dependent on digital technology to survive and develop. This study adapts and improves the five dimensions of accessibility evaluation to better carry out the accessibility evaluation of public digital library cultural services for residents.

1. Accessibility: variety and quantity of satisfaction

Accessibility, i.e., whether the types and quantity of public digital cultural services meet public demand, is a dimension that points to the platform facilities, resources, activities and service personnel of public digital libraries, which is mainly measured in terms of whether the types and quantity of digital service platforms of public libraries, the types and quantity of digital cultural resources such as e-books, e-magazines and periodicals, and audio-visual materials, as well as the types and quantity of online cultural activities and the number of online service personnel can meet users' demand. Whether the number can meet the needs of users is measured.

2. Proximity: time, economy, operational accessibility

Proximity means whether the cultural services of public digital libraries are accessible in terms of time, economy, operation and fairness in obtaining services. The design of the indicators includes easy accessibility of service information (the ways to obtain digital cultural resources and activity information are very convenient and the guidelines are clear), easy operation of the service platform (the service platform is functionally sound, simple to operate and has no invalid links), rationality of the opening time of the service facilities ( (reasonable opening hours for digital equipment in libraries, multimedia equipment in public electronic reading rooms, etc.), basically free service, service attitude (warm and friendly attitude of service staff) and fairness of service (open to all).

3. Acceptability: the fulfillment of service quality expectations

Acceptability is the digital service platform of public digital libraries, the digital cultural resources and activity content provided, the quality of the service personnel, and whether the service process meets the digital cultural expectations of urban and rural residents. The index design of this dimension mainly includes the beauty of the platform interface (the interface of the service platform is beautiful and concise), the friendliness of the service platform (whether traditional and simplified Chinese, multilingual, barrier-free and other services are provided), the stability and security of the service platform (the stable operation of the service platform is stable and the security of the content, the content, digital resources and online cultural activities are updated in a timely manner), the professionalism of the service personnel and the service experience (after using the digital cultural platform, resources and participating in digital cultural activities, you will usually feel a good experience).

4. Adaptability: meeting differentiated needs

Adaptability means whether the service content, mode and way are compatible with public needs and habits, and whether timely adjustments can be made according to the feedback of residents' needs for cultural services. service modes such as "order-based", "menu-based", "reservation-based", etc.), service mode adaptability (adaptable to digitalized cultural service modes such as libraries, service platforms, online historical story scenes, etc.), and service mode adaptability (adaptable to digitalized cultural service modes such as libraries, service platforms, online historical story scenes, etc.). service platform, online historical story scene experience, etc.), and adaptability of demand (availability of demand feedback channels, response, and user experience surveys).

5. Sense of Cultural Acquisition: Spiritual and Cultural Enhancement

This study increases the sense of cultural accessibility to reflect the cultural benefits of public digital cultural services. The final point of the cultural accessibility of public digital libraries is to return to meet the public's growing spiritual and cultural needs, and to enhance the people's sense of access and happiness. Indicators for this dimension include the availability of cultural content (party and government thematic learning content, digital cultural resources with distinctive local characteristics that showcase Chinese culture and tell Chinese stories, and digital cultural activities that promote socialist core values and embody the

spirit of China), the degree of cultural knowledge (in-depth understanding of Chinese culture), and the cultivation of values (the orientation of socialist core values). This study designed the evaluation indexes for the accessibility of cultural services in public digital libraries, taking into account the characteristics and connotations of cultural services in public digital libraries (see Table 1).

Table 1 Framework of indicators for evaluating the accessibility of cultural services in public digital libraries

| Primary indicators | Secondary indicators | Description of indicators |
|---|---|---|
| Accessibility | Number of platform types | Diversified types and number of service platforms such as web-based, APP, and public number of libraries to meet the demand |
| | Number of resource categories | Variety and quantity of digital resources such as e-books, e-magazines and newspapers to meet demand |
| | Number of types of activities | Variety and number of activities such as themed exhibitions and scenario-based experiences of historical stories to meet demand |
| | Number of service personnel | When I need help, I can always find a service person online in a timely manner |
| | Accessibility of information | Easy access to digital cultural resources and information on activities, with clear guidelines |
| | Platform Ease of Use | Web pages, public numbers, APPs and other service platforms are functionally sound and easy to operate, with no invalid links |
| | Time accessibility | Reasonable opening hours for public digital cultural facilities (digital equipment in libraries, multimedia equipment in public electronic reading rooms, etc.) I have free time to use digital cultural platforms, resources and participate in online cultural activities |
| Proximity | Economic accessibility | Services are basically free of charge |
| | Approachability of attitude | The service staff is always warm and friendly |
| | Fairness of service | Services open to all |
| | Interface aesthetics | The interface of the service platform is beautiful and simple |
| | Friendliness | Service platform is user-friendly and easy to use, with services in traditional and simplified Chinese, multi-language, and accessibility |
| Acceptability | Content timeliness | Timely content and push updates of the service platform Digital cultural resources are innovative and up-to-date Digital cultural activities are always close to life with innovative content |
| | Stable Security | The service platform runs stably and is highly secure |
| | Professionalism | The online service staff is always helpful and can answer both professional and non-professional questions |
| | sense of experience | I usually feel that I have a good experience after using digital cultural platforms, resources and participating in digital cultural activities |
| | Aim | The service platform can provide personalized pages and push services based on user preferences |
| Adaptability | Adaptability of the model | Adaptable to a combination of online and offline service models (e.g., "order-based", "menu-based", "appointment-based") |
| | Adaptability of the approach | Cultural service methods that can be adapted to digitalization, such as library service platforms, online historical storytelling scenario experiences, etc. |
| | Requirements adaptability | The service platform has feedback channels for users' needs, such as messages My feedback in the platform is always responded to in a timely manner The service platform conducts regular user experience surveys To be able to conduct a rich and innovative study and education on party and government topics from it |
| Sense of access to culture | Availability of cultural content | Access to digital cultural resources with distinctive local characteristics that showcase Chinese culture and tell Chinese stories Ability to participate in digital cultural activities that promote socialist core values and |

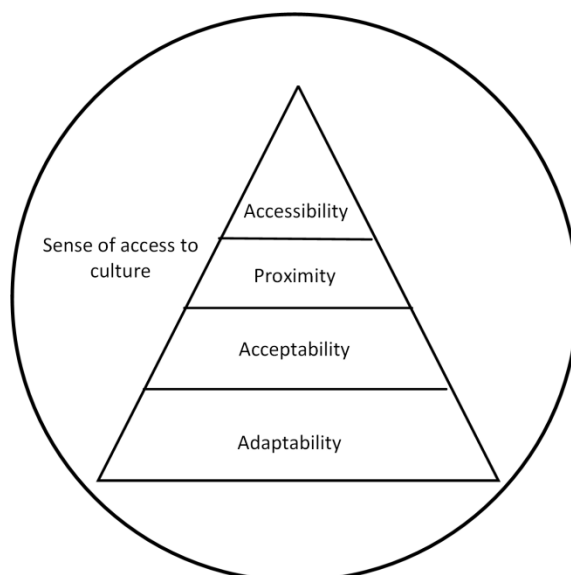| | |
|---|---|
| | embody the spirit of China |
| Cultural awareness | Through such services, I have gained a better understanding of the outstanding Chinese culture (e.g., traditional culture, cultural heritage, etc.) |
| Values development | Through this type of service, my values are closer to the core socialist values |



Fig. 1 Evaluation system for accessibility of cultural services in public digital libraries

(ii) Accessibility evaluation data
1. Description of the questionnaire

This research was conducted on the Internet questionnaire for the residents of G province. Considering the high mobility of the population in G province and the fact that public digital culture relies on Internet technology to provide services, people who live in G province and use the Internet were selected as the research subjects. In this paper, based on the previous research, we determine the theoretical model and put forward the hypothesis; we determine the questionnaire scale with the characteristics of the service, and conduct the pre-survey; we improve the questionnaire according to the data and the feedback of the participants, so as to make the questions more relevant and the contents more understandable, and then form the official questionnaire. The questionnaire of this study was distributed online through Questionnaire Star, a major questionnaire platform in China, and the questions to test the degree of concentration were designed to enhance the validity of the questionnaire.

2. Sample Collection Fact Sheet

In order to understand the current situation of supply and demand of public digital cultural services in Province G as comprehensively as possible, members of the research team distributed online questionnaires on social media channels such as friend circles and WeChat groups with the help of Questionnaire Star platform, and 535 questionnaires were effectively recovered for this research.
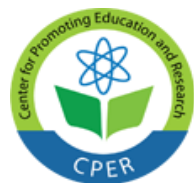
3. Basic information on the questionnaire

The questionnaire is divided into three parts. The first part is the basic information of the population, including age, gender, permanent residence, years of residence, occupation, income, political profile, etc.; the second part is the influencing factors, which are mainly considered from three aspects: personal information retrieval skills, family cultural environment and community cultural environment; the third part is the accessibility evaluation scale, with evaluation dimensions categorized into accessibility, proximity, acceptability, adaptability, and sense of cultural access; and the fourth part is the overall rating and the collection of residents' opinions. Among them, most of the questions in parts 2 and 3 were measured mainly on a scale of 1-10, in an effort to accurately derive residents' accessibility assessment of the current status of cultural services in public digital libraries.

The number of valid questionnaires recovered in this study is 535, among which 382 questionnaires are aware of the public digital library cultural services and evaluated their accessibility, so the data analysis of the scale information in the following section is based on these 382 questionnaires; the number of questionnaires who do not know what the public digital library cultural services are and who have never used the public digital library cultural services amounts to 153 questionnaires.

4. Questionnaire data Reliability
(1) Questionnaire Reliability Analysis

In this study, internal consistency reliability was used as a test as a way to verify the degree of reliability of the questionnaire, i.e., Cronbach's alpha coefficient. The results of the test are shown in Table 2. From the Cronbach's α coefficient values in Table 2, it can be seen that the α values are all above 0.70, which indicates that the questionnaire has very good reliability, and the reliability of the results of the survey of the dimensions within the questionnaire is very good, and it can illustrate the content of the survey to be investigated.

Table 2 Reliability analysis of the questionnaire

| dimension | Cronbach's alpha coefficient |
|---|---|
| personal factor | 0.896 |
| family factors | 0.971 |
| community factors | 0.951 |
| accessibility | 0.898 |
| proximity | 0.924 |
| acceptability | 0.956 |
| adaptability | 0.934 |
| sense of access to culture | 0.949 |
| total questionnaire | 0.984 |

(2) Questionnaire validity analysis

KMO and Bartlett's test were used to test the applicability and feasibility of the factor analysis model, and the test results are shown in Table 3.

Table 3 KMO and Bartlett's test

| Kaiser-Meyer-Olkin metric of sampling adequacy | | 0.975 |
|---|---|---|
| Bartlett's test of sphericity | approximate chi-square (math.) | 15797.485 |
| | df | 528 |
| | Sig. | 0.000 |

From the KMO values, Bartlett values and p-values in Table 3, it is clear that the factor analysis applicability test was passed.
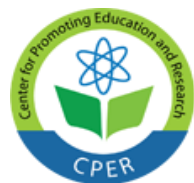
(iii) Descriptive analysis of the sample

1. Basic demographic information

The number of valid questionnaires collected amounted to 382, of which 181 were male, accounting for 47.4%, and 201 were female, accounting for 52.6%, which is similar to the composition of the population of Province G. The number of questionnaires collected amounted to 382, of which 181 were male, accounting for 47.4%, and 201 were female, accounting for 52.6%. In terms of age groups, the age group with the highest proportion is 25-30 years old, and there are fewer respondents older than 46 years old; among them, the proportion of people aged 18-35 years old accounts for nearly 90% of the total sample, which is the main target of the Internet and other digital platforms as well as the key target of this research. The majority of respondents with political profile of the masses amounted to 133, accounting for 34.8% of the sample size. The occupations of the questionnaire respondents included nine major categories, which in descending order of frequency were students, institutions/civil servants/government workers, freelancers, company employees, professionals, service workers, other occupations, workers and housewives, accounting for 20.7%, 16.5%, 13.6%, 12.3%, 11.5%, 9.4%, 8.9%, and 5.8%, respectively, 1.3%. Personal monthly income covered the range of <3000 yuan to >30000 yuan, with more than half of the respondents earning <3000 yuan to 7000 yuan per month. The questionnaire sample covered junior high school and below to graduate school and above, with more than half of the respondents having a bachelor's degree. The largest proportion of questionnaire respondents' place of residence was urban, amounting to 276, or 72.3%, accounting for the vast majority of the sample size; rural households amounted to 106, or 27.7%. With regard to the number of years of residence, the sample covers the range from less than one year to seven years or more, with the number of people who have resided in G province for seven years or more accounting for more than half of the sample, amounting to 239 trips, or 62.6%.

Table 4 Descriptive statistics of the sample

| | | frequency | percentage |
|---|---|---|---|
| gender | male | 181 | 47.4 |
| | female | 201 | 52.6 |
| (a person's) age | Under 18 | 2 | 0.5 |
| | 18~24 | 125 | 32.7 |
| | 25~30 | 146 | 38.2 |
| | 31~35 | 63 | 16.5 |

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| | | | |
|---|---|---|---|
| | 36~45 | 25 | 6.5 |
| | 45 years and over | 21 | 5.6 |
| careers | student | 79 | 20.7 |
| | Career/civil service/government workers | 63 | 16.5 |
| | freelancer | 52 | 13.6 |
| | company employee | 47 | 12.3 |
| | professional | 44 | 11.5 |
| | Service workers | 36 | 9.4 |
| | else | 34 | 8.9 |
| | workers | 22 | 5.8 |
| | housewife | 5 | 1.3 |
| place of permanent residence | countryside | 106 | 27.7 |
| | cities and towns | 276 | 72.3 |
| years of residence at usual place of residence | Less than 1 year | 13 | 3.4 |
| | 1-3 years | 58 | 15.2 |
| | 4-6 years | 72 | 18.8 |
| | 7 years and above | 239 | 62.6 |
| political appearance | the masses | 133 | 34.8 |
| | Communist Youth League member | 110 | 28.8 |
| | democratic party | 15 | 3.9 |
| | Communist Party member | 124 | 32.5 |
| academic background | Junior high school and below | 6 | 1.6 |
| | High school/middle school/technical school | 44 | 11.5 |
| | specialized training school | 73 | 19.1 |
| | undergraduate | 229 | 59.9 |
| | Graduate students and above | 30 | 7.9 |
| father's highest education | Junior high school and below | 125 | 32.7 |
| | High school/middle school/technical school | 119 | 31.2 |
| | specialized training school | 58 | 15.2 |
| | undergraduate | 77 | 20.2 |
| | Graduate students and above | 3 | 0.8 |
| mother's highest level of education | Junior high school and below | 187 | 49 |
| | High school/middle school/technical school | 85 | 22.3 |
| | specialized training school | 50 | 13.1 |
| | undergraduate | 55 | 14.4 |
| | Graduate students and above | 5 | 1.3 |
| post-tax salary | Less than 3,000 yuan | 128 | 33.5 |
| | 3,001-4,000 yuan | 44 | 11.5 |
| | 4,001-5,000 yuan | 44 | 11.5 |
| | 5001-6000 yuan | 41 | 10.7 |
| | 6001-7000 yuan | 34 | 8.9 |
| | 7001-8000 yuan | 20 | 5.2 |
| | 8001-9000 yuan | 16 | 4.2 |
| | 9001-10000 yuan | 16 | 4.2 |
| | 10,001-20,000 yuan | 27 | 7.1 |
| | 20,000-30,000 yuan | 9 | 2.4 |
| | >30,000 yuan | 3 | 0.8 |
| monthly household income after tax | <5000 yuan | 54 | 14.1 |
| | 5000-10000 yuan | 83 | 21.7 |
| | 10,000-15,000 yuan | 66 | 17.3 |

| | | |
|---|---|---|
| 15,000-20,000 yuan | 73 | 19.1 |
| 20,000-25,000 yuan | 38 | 9.9 |
| 25,000-30,000 yuan | 19 | 5 |
| 30,000-35,000 yuan | 12 | 3.1 |
| 35,000 - 40,000 yuan | 12 | 3.1 |
| 40,000-45,000 yuan | 3 | 0.8 |
| 50,000 yuan | 22 | 5.8 |

2. Differential analysis of demographic characteristics in accessibility evaluation

Differences in accessibility scores in terms of demographic variables were analyzed using independent samples t-tests, one-way ANOVA, and nonparametric tests.Due to space limitations and the large number of various types of variables in terms of demographics, only the analytical items that showed significant differences in accessibility scores in terms of demographic variables are shown in this paper, and none of the variables that were not shown demonstrated significant differences.

(1) Differences in accessibility scores in terms of length of residence: higher ratings for longer length of residence

One-way ANOVA was used to study the differences in the accessibility scores of public digital cultural services by the sample's length of residence. From Table 5, it can be seen that the samples with different years of residence show significant differences in the accessibility evaluation scores of public digital cultural services, with the specific mean values as follows: more than 7 years > 4～6 years > less than 1 year > 1～3 years, which indicates that the longer the years of residence, the deeper the samples' understanding of the public digital cultural services in the region, the more they are influenced by them, and thus their evaluation will be slightly higher.

Table 5 Differences in accessibility evaluation scores by year of residence

| analysis term | item | sample size | average value | (statistics) standard deviation | $F$ | $p$ |
|---|---|---|---|---|---|---|
| Accessibility evaluation score | Less than 1 year | 13 | 7.823 | 1.553 | 3.827** | 0.01 |
| | 1～3 years | 58 | 7.668 | 1.622 | | |
| | 4～6 years | 72 | 7.717 | 1.407 | | |
| | More than 7 years | 239 | 8.257 | 1.564 | | |

Note: * indicates significant at the 5% level.

(2) Significant differences in accessibility scores by age

The Kruskal-Wallis test in the non-parametric test was used to analyze the differences in accessibility evaluation scores in terms of age. As can be seen in Table 6, the different age samples showed significant differences in accessibility evaluation scores for public digital cultural services ($p<0.001$).

Table 6 Differences in accessibility assessment scores by age

| analysis term | item | N | average value | (statistics) standard deviation | F | p |
|---|---|---|---|---|---|---|
| Accessibility evaluation score | Under 18 | 2 | 7.788 | 3.300 | 14.097*** | 0.000 |
| | 18~24 | 125 | 7.175 | 1.436 | | |
| | 25~30 | 146 | 8.444 | 1.378 | | |
| | 31~35 | 63 | 8.645 | 1.355 | | |
| | 36~45 | 25 | 8.507 | 1.393 | | |
| | 45 years and over | 21 | 8.229 | 2.002 | | |

Note: *** indicates significant at the 0.1% level.

(3) Significant differences in accessibility scores by occupation

Differences in accessibility evaluation scores in terms of sample occupations were analyzed using the Kruskal-Wallis test in non-parametric tests. As can be seen in Table 7, significant differences ($p<0.001$) were produced in the scores of different occupational samples on public digital cultural services in terms of accessibility evaluation.

Table 7 Differences in Accessibility Assessment Scores by Occupation

| analysis term | item | N | average value | (statistics) standard deviation | F | p |
|---|---|---|---|---|---|---|
| Accessibility evaluation score | professionals | 44 | 8.610 | 1.080 | 12.27*** | 0.000 |
| | Service workers | 36 | 8.237 | 1.074 | | |
| | freelancer | 52 | 8.508 | 1.239 | | |
| | workers | 22 | 7.543 | 1.658 | | |

| | | | |
|---|---|---|---|
| company employee | 47 | 8.146 | 1.593 |
| Career/civil service/government workers | 63 | 8.795 | 1.325 |
| student | 79 | 6.807 | 1.412 |
| housewife | 5 | 8.982 | 1.698 |
| else | 34 | 8.005 | 1.878 |

Note: *** indicates significant at the 0.1% level.

There are significant differences in the accessibility evaluation scores of different occupations, probably because different types of occupations, to a certain extent, determine the frequency of their use of digital devices, which will also affect the frequency of their access to public digital cultural services, such as factory workers in their daily work, basically do not use digital devices, and the likelihood of their access to public digital cultural services is greatly reduced, so different occupations have significant differences in accessibility evaluation scores.

(4) Significant Differences in Accessibility Scores on Individual Monthly After-Tax Income

The differences in the accessibility evaluation scores in terms of the monthly after-tax income of the sample individuals were analyzed using the Kruskal-Wallis test in the non-parametric test. As can be seen from Table 8, different individual after-tax monthly income samples produced significant differences ($p < 0.001$) in the scores of public digital cultural services in terms of accessibility evaluation.

Table 8 Differences in Accessibility Evaluation Scores across Individuals' After-Tax Monthly Income

| analysis term | item | N | average value | (statistics) standard deviation | F | p |
|---|---|---|---|---|---|---|
| Accessibility evaluation score | Less than 3,000 yuan | 128 | 7.366 | 1.783 | 4.601*** | 0.000 |
| | 3,001-4,000 yuan | 44 | 8.196 | 1.596 | | |
| | 4,001-5,000 yuan | 44 | 8.435 | 1.335 | | |
| | 5001-6000 yuan | 41 | 8.208 | 1.371 | | |
| | 6001-7000 yuan | 34 | 8.556 | 1.263 | | |
| | 7001-8000 yuan | 20 | 8.071 | 1.389 | | |
| | 8001-9000 yuan | 16 | 8.549 | 1.023 | | |
| | 9001-10000 yuan | 16 | 8.509 | 1.476 | | |
| | 10,001-20,000 yuan | 27 | 8.636 | 0.753 | | |
| | 20,000-30,000 yuan | 9 | 9.027 | 0.708 | | |
| | >30,000 yuan | 3 | 8.232 | 1.564 | | |

Note: *** indicates significant at the 0.1% level.

There is a significant difference in public digital cultural services between individuals with different after-tax monthly incomes, probably because individuals with higher monthly incomes have access to more types of digital devices, not only receiving digital public cultural services on their cell phones, but also through computers and other devices, and have a deeper understanding of public digital cultural services, and receive them more frequently, so there is a significant difference in the accessibility scores of different individuals with different after-tax monthly incomes. monthly incomes have significant differences in accessibility evaluation scores.

In summary, in the analysis of differences between demographic variables and the evaluation scores of the accessibility of public digital cultural services, the number of years of residence, age, occupation, and personal after-tax monthly income produced significant differences with each of them, whereas the place of permanent residence, gender, and personal education did not produce significant differences.

**(iv) Evaluation of the accessibility of cultural services in public digital libraries**

1. Evaluation results of accessibility dimensions: services have more room for improvement

(1) Evaluation of the accessibility dimension: limited publicity and service platforms, difficult for the public to obtain

The accessibility dimension of the theme of this study consists of three questions in the questionnaire, with 382 valid questionnaires, and the overall mean score of the questions presented as 7.770-8.175 points, presenting that the accessibility of the current public digital cultural services is average, and a certain proportion of the questionnaires still have lower scores.

The standard deviations of A1-A3 questions are all greater than 1, indicating that the data are unevenly distributed, and most of the values differ greatly from the mean, i.e., the mean value does not present the overall data of this part of the questionnaire well. Specifically, the current cultural services of public digital libraries have shortcomings such as insufficient publicity, insufficiently clear and simple guidelines on the online platform, insufficiently rich service content, failure to

comprehensively cover the individual needs of the public, and failure to satisfy the real cultural needs of the general public, and there is still a certain gap between the services and the general public's acceptance of the services.

Table 9 Descriptive statistics of availability

|  | N | minimum value | maximum values | average value | (statistics) standard deviation | variance (statistics) | skewness | kurtosis |
|---|---|---|---|---|---|---|---|---|
| A1 | 382 | 1 | 10 | 7.953 | 1.916 | 3.672 | -1.055 | 0.786 |
| A2 | 382 | 1 | 10 | 8.175 | 1.711 | 2.927 | -1.125 | 1.348 |
| A3 | 382 | 1 | 10 | 7.770 | 2.014 | 4.057 | -1.083 | 1.122 |

(2) Evaluation of the accessibility dimension: the level of service construction needs to be improved urgently.

The approachability dimension of the theme of this study consists of 6 questions, with 382 valid questionnaires, and the overall mean scores of the questions were presented as 7.728-8.275, but there are still cases of low scores.

The standard deviations of the above six questions are all greater than 1, indicating that most of the data have a large difference from the mean, i.e., the representativeness of the sample mean is weak. It can be seen that the residents' recognition of digital public cultural services varies greatly, and the construction level of digital public library cultural services in Province G still needs to be improved. The maximum value of the standard deviation is 2.317 from B2, which shows that the public presents a large degree of difference in perception of whether the public digital library cultural service providers have a warm and friendly working attitude.

Table 10 Descriptive statistics of accessibility

|  | N | minimum value | maximum values | average value | (statistics) standard deviation | variance (statistics) | skewness | kurtosis |
|---|---|---|---|---|---|---|---|---|
| B1 | 382 | 2 | 10 | 7.728 | 1.929 | 3.721 | -0.653 | -0.275 |
| B2 | 382 | 0 | 11 | 8.071 | 2.317 | 5.368 | -1.289 | 1.911 |
| B3 | 382 | 2 | 10 | 8.183 | 1.688 | 2.848 | -0.903 | 0.359 |
| B4 | 382 | 2 | 10 | 8.076 | 1.692 | 2.863 | -0.861 | 0.446 |
| B5 | 382 | 1 | 10 | 8.073 | 1.863 | 3.470 | -1.063 | 0.804 |
| B6 | 382 | 3 | 10 | 8.275 | 1.702 | 2.898 | -0.987 | 0.327 |

(3) Evaluation of Acceptability Dimension: Service Content Fails to Closely Relate to People's Lives

The acceptability dimension of the theme of this study consists of 10 questions in the questionnaire, with 382 valid questionnaires, and the overall mean scores of the questions were presented as 7.78-8.33, but there are still some questionnaires with low scores.

The standard deviations of the above 10 questions are all greater than 1, indicating that the data are unevenly distributed, and that most of the values are different from the mean, i.e., the mean value does not present the overall data of the questionnaire well. It can be said that the public digital libraries have not been able to provide the cultural contents needed by the residents, and the quality of the service staff and the service process have not been well suited to the social and cultural expectations of the urban and rural residents.

Table 11 Acceptability descriptive statistics

|  | N | minimum value | maximum values | average value | (statistics) standard deviation | variance (statistics) | skewness | kurtosis |
|---|---|---|---|---|---|---|---|---|
| C1 | 382 | 2 | 10 | 7.927 | 1.839 | 3.38 | -0.809 | 0.161 |
| C2 | 382 | 1 | 10 | 8.094 | 1.880 | 3.534 | -1.071 | 0.939 |
| C3 | 382 | 1 | 10 | 8.003 | 1.781 | 3.173 | -0.911 | 0.721 |
| C4 | 382 | 1 | 10 | 8.089 | 1.819 | 3.31 | -1.056 | 0.893 |
| C5 | 382 | 1 | 10 | 7.976 | 1.931 | 3.729 | -1.101 | 0.99 |
| C6 | 382 | 1 | 10 | 7.935 | 1.925 | 3.704 | -0.977 | 0.691 |
| C7 | 382 | 0 | 11 | 7.78 | 2.485 | 6.177 | -1.143 | 1.223 |
| C8 | 382 | 0 | 11 | 7.893 | 2.407 | 5.792 | -1.272 | 1.766 |
| C9 | 382 | 1 | 10 | 8.33 | 1.604 | 2.573 | -1.212 | 1.851 |
| C10 | 382 | 1 | 10 | 8.147 | 1.693 | 2.866 | -0.962 | 0.804 |

(4) Evaluation of adaptability dimensions: platforms need to enhance personalized services

The adaptability dimension of the theme of this study consists of six questions in the questionnaire, with 382 valid questionnaires, and the overall mean scores of the questions were presented as 7.631-8.17, although a certain percentage of the questionnaires still had low scores.

According to the questionnaire suggestion of "establishing a sound feedback mechanism" and "hope that there will be a variety of feedback channels online after the exhibition", it reflects that the public thinks that the soundness of the feedback mechanism and channels of the public digital culture platform is somewhat insufficient, and still needs the platform to further improve the construction of the feedback system. It is still necessary for the platform to further improve the construction of the feedback system. According to the questionnaire's suggestions, "the attention to the needs of the elderly can be strengthened", "listen to the voice of the public more", and "improve the level of service from the perspective of the audience", which indicates that the follow-up should be strengthened. This suggests that we should strengthen the degree of demand-orientedness and promote the diversification and scientificization of the platform's information disclosure channels and methods by taking into account the law of the public's reception of information in the era of big data.

The standard deviations of the above six questions are all greater than 1, and there are even three questions with standard deviations all greater than 2, which indicates that the data distribution is uneven, and most of the values have a large difference between them and the mean, that is, the mean does not present the overall data of the part of the questionnaire in a better way. It can be said that there is some room for optimization of public digital libraries in terms of management mechanism, service procedure and service technology.

Table 12 Adaptable descriptive statistics

|  | N | minimum value | maximum values | average value | (statistics) standard deviation | variance (statistics) | skewness | kurtosis |
|---|---|---|---|---|---|---|---|---|
| D1 | 382 | 1 | 10 | 7.898 | 1.8663 | 3.483 | -0.859 | 0.336 |
| D2 | 382 | 0 | 11 | 8.17 | 2.1711 | 4.714 | -1.512 | 3.238 |
| D3 | 382 | 0 | 11 | 7.631 | 2.5804 | 6.659 | -1.1 | 1.009 |
| D4 | 382 | 0 | 11 | 7.707 | 2.555 | 6.528 | -1.114 | 0.975 |
| D5 | 382 | 1 | 10 | 7.95 | 1.9522 | 3.811 | -1.077 | 0.893 |
| D6 | 382 | 1 | 10 | 8.115 | 1.8062 | 3.262 | -1.159 | 1.282 |

(5) Evaluation of the sense of access to culture: the service platform fails to cover better quality cultural content

The cultural access dimension of the theme of this study consists of 6 questions, with 382 valid questionnaires and the overall mean score of the questions presented as 8.094-8.275.

The standard deviations of the above questions are all greater than 1, which indicates that the above means do not reflect the actual situation of cultural access well. Specifically, in the process of the government's provision of public digital cultural services, there is a large gap in the sense of cultural access among different residents. In the questionnaire survey, some respondents commented that "the content is not rich and the experience is not as good as offline", which indicates that how to improve the residents' sense of access to culture is an important part of the construction of cultural services in public digital libraries nowadays.

Table 13 Descriptive statistics on access to culture

|  | N | minimum value | maximum values | average value | (statistics) standard deviation | variance (statistics) | skewness | kurtosis |
|---|---|---|---|---|---|---|---|---|
| E1 | 382 | 1 | 10 | 8.275 | 1.696 | 2.877 | -1.251 | 2.029 |
| E2 | 382 | 1 | 10 | 8.170 | 1.673 | 2.798 | -0.948 | 0.646 |
| E3 | 382 | 1 | 10 | 8.238 | 1.655 | 2.738 | -1.058 | 1.117 |
| E4 | 382 | 1 | 10 | 8.154 | 1.704 | 2.903 | -0.992 | 0.969 |
| E5 | 382 | 1 | 10 | 8.270 | 1.692 | 2.864 | -1.163 | 1.425 |
| E6 | 382 | 1 | 10 | 8.094 | 1.845 | 3.403 | -1.017 | 0.691 |

2. Comprehensive assessment of accessibility: mismatch between supply and demand for services, accessibility to be improved
(1) Factor extraction

Exploratory factor analysis was conducted through SPSS to extract the main factors for the evaluation of the accessibility of public digital cultural services, and five main factors were extracted from the original statistical indicators, and the cumulative variance contribution rate of the five loaded factors extracted amounted to 80.904%.
(2) Factor Rotation

The factor loading matrix was rotated orthogonally by using the method of extreme value of variance, and the rotated factor loading matrix was obtained. According to the output of the factor loading matrix, the indicators are divided into five categories, and the main factors are named in combination with the specific meanings represented by the aforementioned evaluation indicators: the main factors F1, F2, F3, F4, and F5 are named as "service type and proximity factor", "service acceptance and demand adaptability factor", "service adaptation and accessibility factor", "service adaptation and accessibility

factor", "service accessibility factor", "service acceptance and demand adaptability factor", "service adaptation and accessibility factor", and "service accessibility factor". F1, F2, F3, F4 and F5 are named as "service type and closeness factor", "service acceptance and demandability factor", "service adaptation and accessibility factor", "service effectiveness and fairness factor" and "service accessibility factor" respectively.

(3) Calculation of factor scores

Based on the matrix of factor score coefficients, a linear weighted comprehensive evaluation model can be established to obtain the score function of the five male factors, and then weighted and summarized with the variance contribution rate of each main factor as the weights to calculate the sum score of the individuals, i.e.:

$$f = (22.379f1 + 1.67f2 + 1.272f3 + 0.777f4 + 0.6f5) / 80.904$$

(4) Evaluation results

Based on the above analysis, the evaluation of the five dimensions of accessibility, proximity, acceptability, adaptability and sense of cultural access are all at a medium level, and the evaluation of the accessibility of cultural services of public digital libraries in Province G is average. The current supply process of public digital cultural services has a supply and demand suitability that needs to be improved. It is mainly reflected in the following aspects: First, there is still a certain gap between the types and quantity of services and the needs of the masses, and the difference in service supply between urban and rural areas is more obvious. Second, there is still a certain distance between the construction and content design of the service platform and the public's expectations, and the platform's interactivity and level of operation and maintenance need to be strengthened; third, the feedback mechanism for the supply and demand of services is not yet perfect, the collection of and response to the public's needs need to be further improved, and the staff's professional skills need to be upgraded. Fourthly, the publicity and promotion of the service need to be strengthened in order to attract more users and increase the utilization rate of the service.

To summarize, the cultural services of public digital libraries do not cover a wide range of people, and there is much room for improvement and development. In this regard, the following article will explore the specific factors affecting the evaluation of the accessibility of the cultural services of public digital libraries based on the three-dimensional perspective of "individual-family-community", with the aim of putting forward corresponding suggestions to improve the accessibility of the cultural services of public digital libraries.

## IV. The three-dimensional perspective of "individual-family-community": analysis of impact effects

1. Individual level: inherent characteristics and information skills retrieval ability constitute intrinsic factors

Individual members of the public, with their own inherent characteristics, such as age, education, occupation, financial means, political affiliation and years of permanent residence, have different impacts on the public's use of public digital cultural accessibility.

In terms of age, younger people are more receptive to new trends and have better learning abilities than older people, making them more willing to experience public digital cultural services. The level of education directly affects an individual's cultural literacy, and people with different cultural literacy may have different needs for public digital cultural services, thus affecting the accessibility of public digital cultural services. Occupationally, on the one hand, some occupations such as artists may have a higher demand for public digital culture than others; on the other hand, the amount of leisure time may also affect the frequency of public participation in public digital cultural services. In terms of income, public cultural services belong to a higher level of need, so income may also have an impact on the demand for public digital cultural services. The public's political outlook affects one's level of political socialization; if the public is more politically socialized and has a high level of recognition for the government, then this policy recognition situation is bound to be high (Yongfeng Yang, 2013). People tend to seek services at their place of residence when accessing cultural needs. Publics with a high number of years of permanent residence tend to have more access to local public digital cultural services.

Public information literacy is also crucial to the accessibility of public digital cultural services. Information literacy of the public includes information awareness (information interest, information convenience, information value) and information skills (retrieval skills, retrieval expression, retrieval self-help, retrieval confidence) (Meng Wang, Ya Chen, 2018). Public digital cultural service is a new form of public cultural service developed in the context of a series Sof cutting-edge information technologies. Traditional information retrieval methods are no longer applicable to today's environment, and whether or not the public has information awareness and information skills directly determines whether or not the public can understand and correctly use public digital cultural services.

2. Family level: family characteristics constitute micro-external factors

As far as the characteristics at the family level are concerned, they are mainly related to parental education, family income, and family cultural activities reference situation. With the development of the times, the role of modern technology in the process of cultural education and inheritance in modern families is becoming increasingly important. Income is a more important influence on residents' cultural consumption, generally speaking, with the increase of family income, residents' expenditure on

cultural consumption will rise (Jilin Zhao and Heqing Gui , 2014). Meanwhile, the level of education is one of the main factors affecting residents' access to public cultural services. And parents' education level and values tend to influence families' cultural choices through cultural intergenerational transmission. In addition, participation in family cultural activities will largely drive the joint participation of family members.

3. Community level: community identity constitutes a macro-external factor

Communities bear the function of providing certain public cultural services, and community public cultural services, as the last kilometer of public cultural services, are related to the people's life experience.

Specifically, community characteristics include community network conditions, community publicity, community cultural exchange and community cultural demand feedback. Community network conditions are the basis for people to access public digital cultural services in the community. Community publicity provides opportunities for people to access public digital cultural services. Community cultural exchange further builds people's evaluation of public digital culture on the basis of community cultural publicity. And community education provides cultural facilities and spatial carriers for the formation of healthy community culture (Wen Wang, 2021). In addition, in order to provide precise public cultural services, the community has to conduct the necessary collection and feedback on the cultural needs of community residents. All these factors have a certain impact on the public's choice of public digital cultural services and evaluation of public digital cultural services.
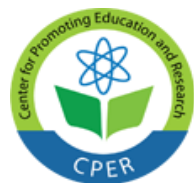
## V. Conclusions and Future Developments

This study takes residents of Province G as the research object, constructs a public digital library service accessibility evaluation index system, analyzes the current situation of public digital library service accessibility in Province G, and explores its influence from the three-dimensional perspective of "individual-family-community" factors. The results of the study show that significant progress has been made in the construction of public digital libraries in Province G. However, the overall accessibility of services is still at a medium level, with problems such as the match between supply and demand needing to be improved, and insufficient publicity, which is still a gap between fully meeting the public's growing cultural needs.

At the individual level, factors such as personal information retrieval skills, occupation and income significantly affect the accessibility of public digital library services. Individuals with higher information literacy are able to utilize digital library resources more effectively, while low-income groups and those with limited occupations face higher barriers to access. At the family level, family participation in cultural activities, parental education and family income have a significant impact on residents' cultural needs and acceptance of digital library services. At the community level, it depends on the conditions of the community network, publicity efforts and the degree of improvement of the feedback mechanism for cultural needs. These factors are intertwined and together affect the realization of public digital library service accessibility. Further analysis reveals that the current evaluation of the accessibility of public digital library services by users of public digital cultural services needs to be improved, and about 10% of the public are not aware of public digital library cultural services. This is mainly due to the gap between the service content and users' needs, as well as the need to strengthen publicity and promotion. The relatively low match between supply and demand has led to idle and wasted resources, and to a certain extent affected users' satisfaction and trust in digital library cultural services. This status quo has triggered us to think about how to improve service awareness and promote service accessibility.

In order to solve this status, this study puts forward the following suggestions: (i) Deepen the analysis of user needs and provide personalized services. Digital libraries should make use of big data and artificial intelligence technology to accurately identify users' interests and needs, open up the user feedback system, and promptly adjust services based on feedback. Based on user profiles, they should provide personalized resource recommendations and service customization, and ensure that the activities are practical and interesting, so as to attract more users to participate. (ii) Improve the quality and service level of librarians. The quality of librarians directly affects the overall level of library services. Therefore, the library should strengthen the professional ethics education, set up a "reader first" service concept, for each job position to carry out a variety of forms of business training to enhance the business skills and professionalism of librarians. At the same time, the establishment of a variety of quantifiable incentives to create a relaxed and harmonious competitive environment to stimulate the librarians to work on their own initiative and enthusiasm. (iii) Enrich the forms of publicity and promotion, and integrate digital resources. As a place where information resources are gathered, digital libraries should not only collect digital resources, but also consider how to better serve readers and improve the accessibility of digital cultural services. Digital library resources and their characteristics are publicized through a variety of channels to improve service awareness. At the same time, in response to the problems of multi-platform retrieval, inconsistent data standards, and duplicated and intersecting database contents in the digital resource system, digital libraries should de-duplication process the retrieval results, establish a one-stop retrieval platform, and realize cross-database retrieval to improve the matching of supply and demand.

In summary, enhancing the accessibility of public digital library services requires multidimensional and multilevel concerted efforts. It is necessary to pay attention to the enhancement of individual information literacy, as well as the creation of a

cultural environment in the family, and at the same time to strengthen the construction of community infrastructure and publicity and promotion efforts. Through precise and efficient services, we can enhance the matching of supply and demand, realize the sharing of public cultural resources for the benefit of all, and ultimately meet the growing spiritual and cultural needs of the people.

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